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AN HISTORICAL PERSPECTIVE ON ILLINOIS COAL RESOURCES AND PRODUCTION, 1960-1984

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Illinois Department of
Energy and Natural Resources

James R. Thompson, Governor
Don Etchison, Director

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AN HISTORICAL PERSPECTIVE ON ILLINOIS COAL
RESOURCES AND PRODUCTION, 1960-1984

Prepared by

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¹Prepared under contract with the Illinois Department of Energy and Natural Resources as project number 85/3008 to M. Fred Ellis, Springfield, Illinois.



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NOTE

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INTRODUCTION

Estimates by the Illinois State Geological Survey identify total mapped coal reserves in Illinois at 181 billion tons, with 79.1 billion tons classified as demonstrated reserves. These demonstrated reserves are located in many coal seams throughout Illinois, but only seven seams have been commercially developed. In comparison to proven oil reserves, Illinois' demonstrated coal reserves are equal to 1,660 quadrillion BTU, or 1.7 times larger than the proven oil reserve BTU of Saudi Arabia and about 3.4 times the BTU of North American proven oil reserves. Currently, Illinois coal producers are mining about 1.3 quads of coal per year.

The future of Illinois coal, however, is questionable because of the uncertainty with electric utility growth, nuclear power and acid rain. Electric utilities consume approximately 85 percent of Illinois coal annually. With this large demand by electric utilities, Illinois coal sales are being affected by the minimal growth in this industry. Additional coal-fired generating capacity has been postponed or canceled by many electric utilities. Moreover, the increase in nuclear power generation in Illinois will have an impact on

electricity generated from present day coal-fired capacity. Economic dispatching will force utilities to use their nuclear capacity first, supplemented by coal capacity to meet additional demand, thus causing utilities to consume less coal. Finally, at the federal level, greater public support for sulfur dioxide (SO₂) control may impact the future of Illinois high sulfur coal sales. In 1980, U.S. SO₂ emissions by the electric utility industry were about 16 million tons. Legislation introduced in the U.S. Congress is attempting to reduce this amount by 8-12 million tons annually. Various studies have been performed on the economic impact of such legislation to the Illinois coal industry. These analyses tend to show a reduction in Illinois coal sales of 10 to 90 percent, depending on the type of strategy adopted.

Because of environmental constraints on the use of high sulfur coal, Illinois electric utilities have installed four scrubbers, totaling 1,306 megawatts of installed capacity and representing about six percent of Illinois coal-fired capacity. Installed capital costs for these four units range from \$121 to \$264 per kilowatt. According to published data by the U.S. Department of Energy, operation and maintenance costs for these four units have averaged about 10 mills per kilowatt hour. Moreover, these systems are reporting high reliability and

dependability. Data published by the U.S. Environmental Protection Agency (U.S. EPA) indicate the systems are removing 90 percent of SO₂, with no major scrubber problems. Dependability, through the years, according to U.S. EPA data, has increased from less than 30 percent to more than 85 percent.

Further, the Illinois coal industry cleaned more than 95 percent of its coal in 1984, utilizing special preparation plants. These plants remove approximately one-third of the sulfur, as well as other impurities, at a cost of \$9 to \$12 per ton. For the end-user, coal cleaning decreases the quantity of sulfur and ash; increases the heating value per pound of coal; reduces transportation costs; improves boiler efficiency and reliability; and decreases boiler maintenance. Further, the annual cost of coal cleaning is less than the cost of scrubbers. Many utilities are using a combination of coal cleaning and scrubbing to remove sulfur and lower the cost of meeting environmental guidelines.

With the concern over the future use of Illinois coal, the following report was written as a resource document on Illinois coal resources and production. In researching Illinois coal, it was found that no individual report contains information on Illinois coal resources;

Illinois coal producers; mine employment, production and revenue; coal prices; and quality and quantity of mine resources from an historical perspective. The following study is intended to furnish the reader with information on Illinois coal resources and the major coal producers from a twenty-five year and 1984 perspective. This data is important since a majority of Illinois coal production is controlled by a relatively small group of companies. The study also examines who the major Illinois coal producers have been since 1960 and their respective coal production from year-to-year.

The report is broken into three sections. Section I examines the coal resources of the Illinois Basin Coal Field, followed by a more thorough description of the seven major coal seams in Illinois. The discussion of the seven major seams will cover the development potential of the coal resource, location of economic deposits, type of mining, and quality and quantity of the coal. Section II discusses Illinois coal production from a perspective of the previous twenty-five years and the most recent year (1984). Detail is given to the ownership of the major coal producers in Illinois; a brief history of the major coal producers; coal production by company; characteristics of current active mines and coal characteristics by mine. Section III examines historical

coal prices, historical mine employment, earnings and mine production, and the economic impact of coal mining at the State and county level.

Data furnished in this report were gathered from public documents at the State and Federal level. Letters of inquiry were sent to the major coal producers in Illinois for additional or more precise data concerning individual companies. In most cases, the coal companies did not respond, or responded that the information was considered proprietary. Whenever conflicting data were found, third sources were compared to gather a general consensus of the data.

In some cases, data used are approximate, since there are many variables to be considered. For example, under annual mine production capacity, variables such as man-hours per week and number of shifts per day will have an impact on these figures. In most cases, coal producers considered annual mine capacity and remaining coal reserves as confidential and would not verify the numbers used in this report. Also, the mine value of the coal used in Table 3-1 through 3-10 were derived from monthly fuel costs and reflect end-user cost minus transportation costs. Finally, the reader should refer to the "Notes" whenever cited in the report. The additional information

should help the reader with any questions they may have.

Primary sources used in this report were gathered from the U.S. Department of Energy; Illinois Department of Energy and Natural Resources (including the Illinois State Geological Survey); Illinois Department of Mines and Minerals; Illinois Energy Resources Commission; Moody's Industrial Manual; Keystone's 1984 Coal Mine Directory and other private sources.

SECTION I: DEMONSTRATED COAL RESOURCES

Demonstrated Coal Resources

Herrin (No.6) Coal Seam

Springfield (No.5) Coal Seam

Colchester (No.2) Coal Seam

Danville (No.7) Coal Seam

Seelyville Coal Seam

Davis and Dekoven Coal Seams

Low To Medium Sulfur Content

DEMONSTRATED COAL RESOURCES

The U.S. Department of Energy's Energy Information Administration (EIA) has compiled the demonstrated reserve base (DRB) from a variety of sources, mainly U.S. and State mining agency reports, and other mineral reports. EIA defines the DRB as:

"a collective term for the sum of coal in both measured and indicated resource categories which represents 100 percent of the coal. Included are: beds of bituminous and anthracite coal 28 or more inches thick and beds of subbituminous coal 60 or more inches thick that occur at depths to 1,000 feet, and thinner or deeper beds that are presently being mined commercially. The demonstrated reserve base represents that portion of the identified coal resource from which reserves are calculated. Generally, the estimated recovery factor for deep-mines and surface-mines are 50 and 80 percent, respectively."

As of January 1, 1983, the Illinois Basin Coal Field (Basin) in Illinois, southwestern Indiana and western Kentucky contained a DRB of approximately 110 billion tons of bituminous coal. According to EIA, Illinois' portion of this total is over two-thirds (79.1 billion tons), or equivalent to about one-third (30.9%) of U.S. DRB of bituminous coal. Until recently, Illinois had ranked

third in total coal reserves, but in 1982 and 1983 the DRB of Illinois was increased by EIA to reflect newly published data from the Illinois State Geological Survey (Survey) on surface and deep coal resources. With these adjustments, Illinois has replaced Wyoming as the state with the second largest DRB.

Western Kentucky is second in Basin coal reserves with 20.9 billion tons (18.9% of Basin and 8.2% of U.S. bituminous DRB). This places western Kentucky fourth in U.S. bituminous coal DRB. For Indiana, EIA reports a DRB of 10.5 billion tons, representing 9.5 percent of Basin and 4.1 percent of U.S. bituminous coal DRB. Indiana ranks third in Basin reserves and seventh in U.S. bituminous reserves.

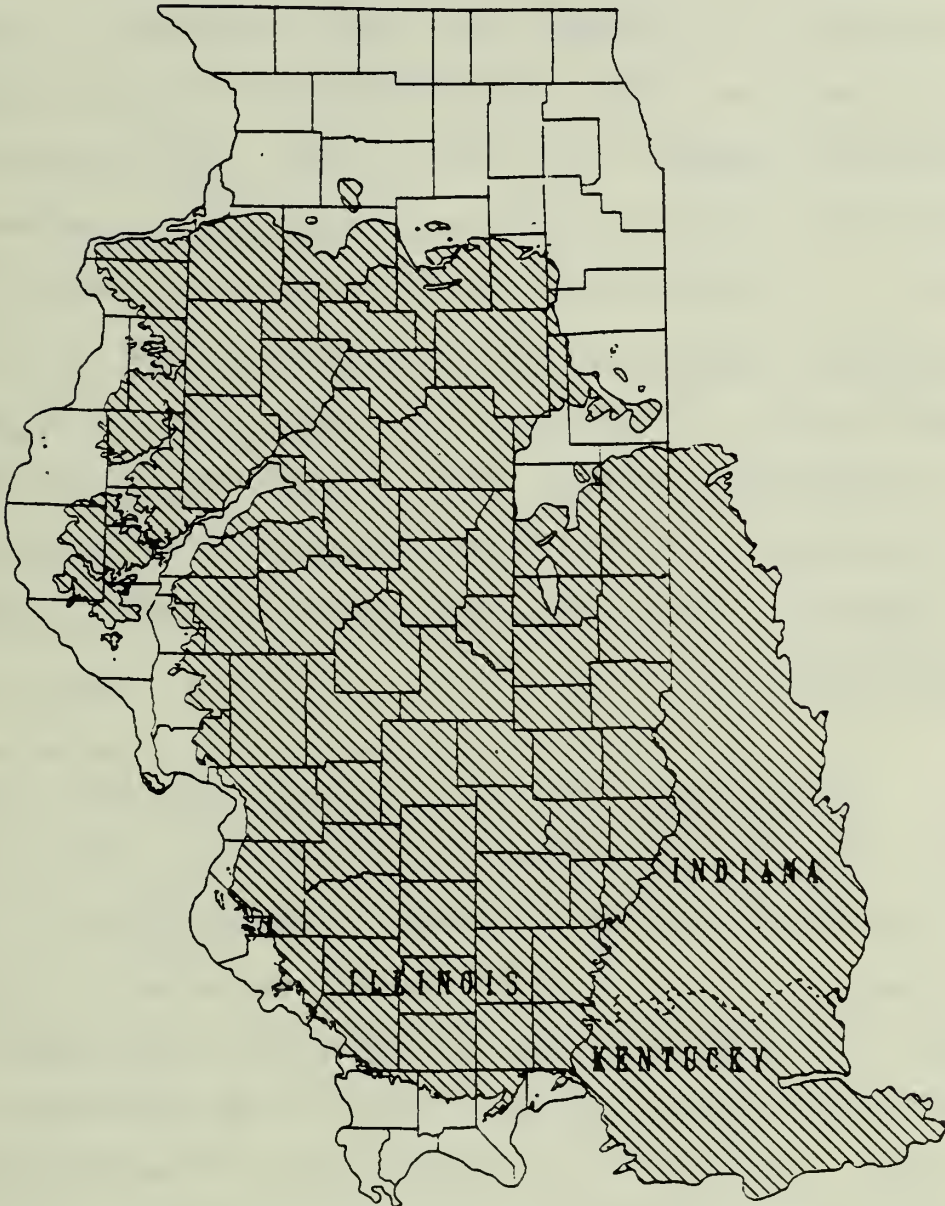
Table 1-1 lists the DRB for the top eleven states or portion of state, according to rank of coal. The eleven states included in the table account for 91.6 percent of U.S. DRB. Eastern and western Kentucky are considered separately because eastern Kentucky is part of the Appalachian Basin, where much of the coal is lower in sulfur than the coal of western Kentucky. Map 1-1 geographically shows the Illinois Basin Coal Field. The Illinois Basin represents a portion of the Interior Region which comprises: Arkansas; Illinois; Indiana; western

TABLE 1-1
DEMONSTRATED COAL RESERVE BASE
BY TYPE OF COAL AND AREA
MILLION SHORT TONS

STATE/AREA	TOTAL	ANTHRACITE	BITUMINOUS	SUB- BITUMINOUS	LIGNITE
MONTANA	120,313		1,385	103,164	15,764
ILLINOIS	79,052		79,052		
WYOMING	69,564		4,441	65,123	
WEST VIRGINIA	39,109		39,109		
PENNSYLVANIA	30,034	7,074	22,960		
WESTERN KENTUCKY	20,885		20,885		
EASTERN KENTUCKY	19,316		19,316		
OHIO	18,890		18,890		
COLORADO	17,195	26	9,024	3,955	4,190
TEXAS	13,813				13,813
INDIANA	10,484		10,484		
NORTH DAKOTA	9,952				9,952
OTHER STATES	40,906	231	30,032	9,242	1,401
TOTAL	489,513	7,331	255,578	181,484	45,120

Source: U.S. Department of Energy.

ILLINOIS BASIN COAL FIELD
ILLINOIS, SOUTHWESTERN INDIANA AND WESTERN KENTUCKY



Kentucky; Iowa; Kansas; Missouri; Oklahoma and Texas.

Illinois' DRB of bituminous coal of 79.1 billion tons is located in approximately 37 thousand square miles of Illinois, representing 65 percent of the state. It is important to remember that the Survey has for many years followed a coal resource/reserve classification that differs somewhat from that of EIA. EIA interprets Survey published data in terms of its own classification scheme; this is the reason why resource/reserve numbers by the two agencies differ. Also, the Survey refers to coal in the ground as resources and does not use the term "demonstrated reserve base." Since most of the following data was collected from Survey publications, the term "resource" will be used, unless another source and definition are cited.

Bituminous coal is the most common coal, accounting for about 50.6 percent of U.S. DRB. The EIA defines bituminous coal as a "dense, black coal with an ignition temperature of 700-800 degrees Fahrenheit." Bituminous coal is primarily used for generating electricity, making coke and space heating. Within the bituminous rank are five groups: "low-volatile"; "medium-volatile"; "high-volatile A"; "high-volatile B" and "high-volatile C". Illinois coal is classified as a high-volatile

bituminous coal. According to the Survey, characteristics of Illinois coal are:

- heating value of 9,600 to 13,000 BTU per pound;
- ash content of 10% to 15%;
- moisture content of 3% to 20%;
- volatile matter of 30% to 45%;
- sulfur content of 1% to 5%, overall averaging 3.2%; and
- chlorine content of .01% to .8%.

Of the 181 billion tons of mapped coal resources the Survey has identified in Illinois, 161 billion tons are classified as deep-minable resources (88.8% of total resources). Of this total, about 44 billion tons or 87.8 percent of total resources are considered to have a high development potential. [Note 1]. The Survey defines deep-minable high development resources as:

"coal deposits that are greater than 4.5 feet thick with less than 400 feet of overburden, or more than 5.5 feet thick but less than 1,000 feet deep."

Deep-minable resources with a high development potential are located in 67 counties, with the top ten counties accounting for 60.3 percent of this total. The top ten counties with high potential deep-minable resources appear in Table 1-2.

Illinois' in-place resources of surface-minable coal total approximately 20.4 billion tons. These resources are greater than 1.5 feet thick with no more than 150 feet of overburden. These resources are located in 52 counties, but mostly in western and southern Illinois. The Survey estimates that 6.1 billion tons have a high development potential. High development potential resources are those coal deposits that have characteristics similar to present-day surface-mine operations. High potential surface-minable resources are located in 38 counties, with the top ten counties totaling 4.1 billion tons, or 66.9 percent of this total. Table 1-2 lists the top ten counties with high development surface-minable resources, their respective high development potential resources and percent of total high development potential surface-minable resources.

Minable coal seams of Illinois were deposited during the Pennsylvanian period, some 280-320 million years ago. These deposits occur in what is known as the "Eastern Interior Region" or "Illinois Basin Coal Field." There are more than eighty coal seams in Illinois, of which approximately twenty-two major and minor coal seams have been mined, or have the potential for development. According to the Survey, the coal deposits are mostly covered by drift, which consists of "unconsolidated

TABLE 1-2
HIGH DEVELOPMENT POTENTIAL
DEEP AND SURFACE-MINABLE RESOURCES
MILLIONS OF TONS

COUNTY	SURFACE MINABLE RESOURCES		DEEP MINABLE RESOURCES	
	TONS	% OF TOTAL	TONS	% OF TOTAL
FULTON	672	11.0		
GREENE	226	3.7		
HENRY	201	3.3		
KNOX	520	8.5		
MADISON	252	4.1		
PEORIA	642	10.5		
PERRY	650	10.7		
RANDOLPH	223	3.7		
ST. CLAIR	427	7.0		
STARK	268	4.4		
OTHER	2,011	33.1		
CHRISTIAN			3,481	7.9
CLINTON			2,150	4.9
FAYETTE			1,992	4.5
LOGAN			1,977	4.5
MACOUPIN			2,966	6.8
MONTGOMERY			3,466	7.9
SANGAMON			3,316	7.6
SHELBY			1,584	3.6
VERMILION			1,998	4.6
WASHINGTON			3,503	8.0
OTHER			17,416	39.7
TOTAL	6,092	100.0	43,849	100.0

SOURCE: Illinois State Geological Survey.

materials left by the glaciers during the Pleistocene Epoch: the time of the great ice ages." The drift includes clay, sand, gravel, limestone, boulders and silt, and measures from several feet to hundreds of feet in thickness. Of the total coal deposits in Illinois, approximately 95 percent is contained in the "middle Pennsylvanian" known as the Kewanee Group. The two major seams found in this group are the Springfield (No.5) and Herrin (No.6) coals. [Note 2]. The major coal seams in Illinois are named after towns in or near the area of primary occurrence or mining activity. Many have been numbered based on age of deposit or lowest coal. The Survey ranks the seven major coal seams, from oldest to youngest as: Davis; Dekoven; Seelyville; Colchester (No.2); Springfield (No.5), Herrin (No.6) and Danville (No.7). [Note 3].

Of the twenty-two major and minor coal seams, only seven have a high potential commercial development. The seven, based on total coal resources are: Herrin (No.6); Springfield (No.5); Colchester (No.2); Danville (No.7); Seelyville; Davis and Dekoven.

Table 1-3 lists the major coal seams; location of economic deposits; coal thickness; depth of overburden; sulfur content; resources and type of mining. Table 1-4

lists the major coal seams and their respective coal production and percent of total production, for the period 1960-1984. A narrative description of the major coal seams follows.

TABLE 1-3
MAJOR COAL SEAMS IN ILLINOIS
LOCATION OF ECONOMIC DEPOSITS AND CHARACTERISTICS

COAL SEAM	LOCATION/COUNTY	COAL THICKNESS	DEPTH	SULFUR CONTENT	RESOURCES	TYPE OF MINING
HERRIN (NO. 6)	THROUGHOUT THE STATE, BUT PRIMARILY SOUTHERN AND WEST-CENTRAL ILLINOIS	3'-15'	100'-1,200'	2.5-5% (7 B. TONS OF 1-2.5% SULFUR)	74 BILLION TONS (35 B. TONS WITH HIGH POTENTIAL)	UNDERGROUND AND SURFACE
SPRINGFIELD (NO. 5)	MAINLY SOUTHEASTERN AND WEST CENTRAL ILLINOIS	3'-8'	200'-1,000'	2.5-5% (1.9 B. TONS OF 1-2.5% SULFUR)	59 BILLION TONS (10 B. TONS WITH HIGH POTENTIAL)	UNDERGROUND AND SURFACE
COLCHESIER (NO. 2)	ELIHU, LASALLE, WILL, GRUNDY, KANKAKEE AND WEST OF ILLINOIS RIVER	2'-3.5'	THIN LAYER OF OVERLIE	2.5-5% (SOME LOW SULFUR COAL)	15 BILLION TONS (1.2 B. TONS WITH HIGH POTENTIAL)	SURFACE
DAWVILLE (NO. 7)	MAINLY EAST CENTRAL, ILLINOIS	2'-6'	TO 150' (ALTHOUGH NO. 7 IS FOUND AT A DEEPER LEVEL)	3-5%	12 BILLION TONS (2 B. TONS WITH HIGH POTENTIAL)	UNDERGROUND AND SURFACE

TABLE 1-3 CONTINUED

COAL SEAM	LOCATION/COUNTY	COAL THICKNESS	DEPTH	SULFUR CONTENT	RESOURCES	TYPE OF MINING
SEELYVILLE	EAST CENTRAL ILLINOIS— CLARK, CRAWFORD, JASPER AND CUMBERLAND COUNTIES	3.5'-9'	350'-1,500'	TO 4%	9.7 BILLION TONS (1.3 B. TONS WITH HIGH POTENTIAL)	UNDERGROUND
DAVIS AND DEXOVEN	GALLATIN, SALINE AND EAST WILLIAMSON	3'-6.5'	TO 1,500'	2-4% (NO LOW TO MEDIUM SULFUR COAL)	5.2 BILLION TONS	MAINLY SURFACE

SOURCE: Illinois State Geological Survey.

TABLE 1-4
 PRODUCTION BY COAL SEAM
 TOTAL PRODUCTION AND PERCENT OF TOTAL
 1960-1984

COAL SEAM	PRODUCTION (TONS)	% OF TOTAL PRODUCTION
HERRIN (NO.6)	1,061,407,160	74.9
SPRINGFIELD (NO.5)	280,469,826	19.8
COLCHESTER (NO.2)	54,314,253	3.8
DANVILLE (NO.7)	15,363,389	1.1
DAVIS/DEKOVEN	6,333,030	.4
TOTAL	1,417,887,658	100.0

SOURCE: Illinois Department of Mines and Minerals.

HERRIN (NO.6) COAL SEAM

The Herrin (No.6) seam is the largest and most extensively mined coal deposit in Illinois. For the past 100 years, both the Herrin (No.6) and Springfield (No.5) seams have supplied most of the market for Illinois coal. The Herrin (No.6) is located in 58 counties, but primarily in central and southern Illinois. According to the Survey, the Herrin coal seam is correlated with the (No.11) coal of western Kentucky, the Herrin coal seam of Indiana, the Mystic coal of Iowa and the Lexington coal of Missouri and Kansas.

In-place resources are estimated at 74 billion tons, representing about 40.8 percent of total coal resources in Illinois. Thirty-five billion tons are classified as having a high development potential, of which about 32 billion tons are deep-minable.

Map 1-2 shows the distribution and thickness of the Herrin (No.6) seam in Illinois according to Class I and II coal greater than 42 inches in thickness. The Survey defines Class I as:

"the highest category of reliability and based on proved or probable coal resources from closely spaced sample sites or measurements, and partly on

geologic projections. Class II is the lowest category of reliability and based on geologic projections from areas of high reliability and on measurements interpreted from geophysical logs of oil test holes."

The depth of overburden for the Herrin (No.6) ranges from about 100 to 1,200 feet. In 1984, the depth of the overburden at 21 deep-mine sites ranged from 124 to 996 feet, with a weighted production depth of 427 feet. For 15 strip-mine operations in 1984, the depth of overburden varied from 15 to 125 feet, with a weighted production depth of 70 feet. Average depths of overburden for deep and surface operations were determined by weighting each mine's depth by its production and summing the weighted depths for each category.

State-wide, the Herrin (No.6) coal resources range from about 3 feet to 15 feet in thickness, with a weighted average of 5.5 feet. Based on data for 1984 from 15 strip-mine operations, the coal thickness varied from 3 to 8 feet, with a production weighted coal thickness of 5.1 feet. For 21 deep-mine operations, the coal varied from 4.5 feet to 8.5 feet, with a weighted production thickness of 7.1 feet.

Sulfur content varies from about 1 to 5 percent,

with a statewide weighted average of 3.2 percent. The Survey estimates that about 7 billion tons of Herrin (No.6) have a relatively low sulfur content of 1 to 2.5 percent, most of which has a high potential for development. For production in 1984, sulfur content at 21 deep-mine sites ranged from .9 to 3.7 percent, with a weighted sulfur content of 2.5 percent; while the sulfur content at 15 strip-mine sites varied from 1.1 to 3.1 percent, with a weighted average of 2.6 percent. Of the major coal operators in this study, nine coal operations in 1984 were mining Herrin (No.6) coal with a sulfur content of 2 percent or less, after cleaning.

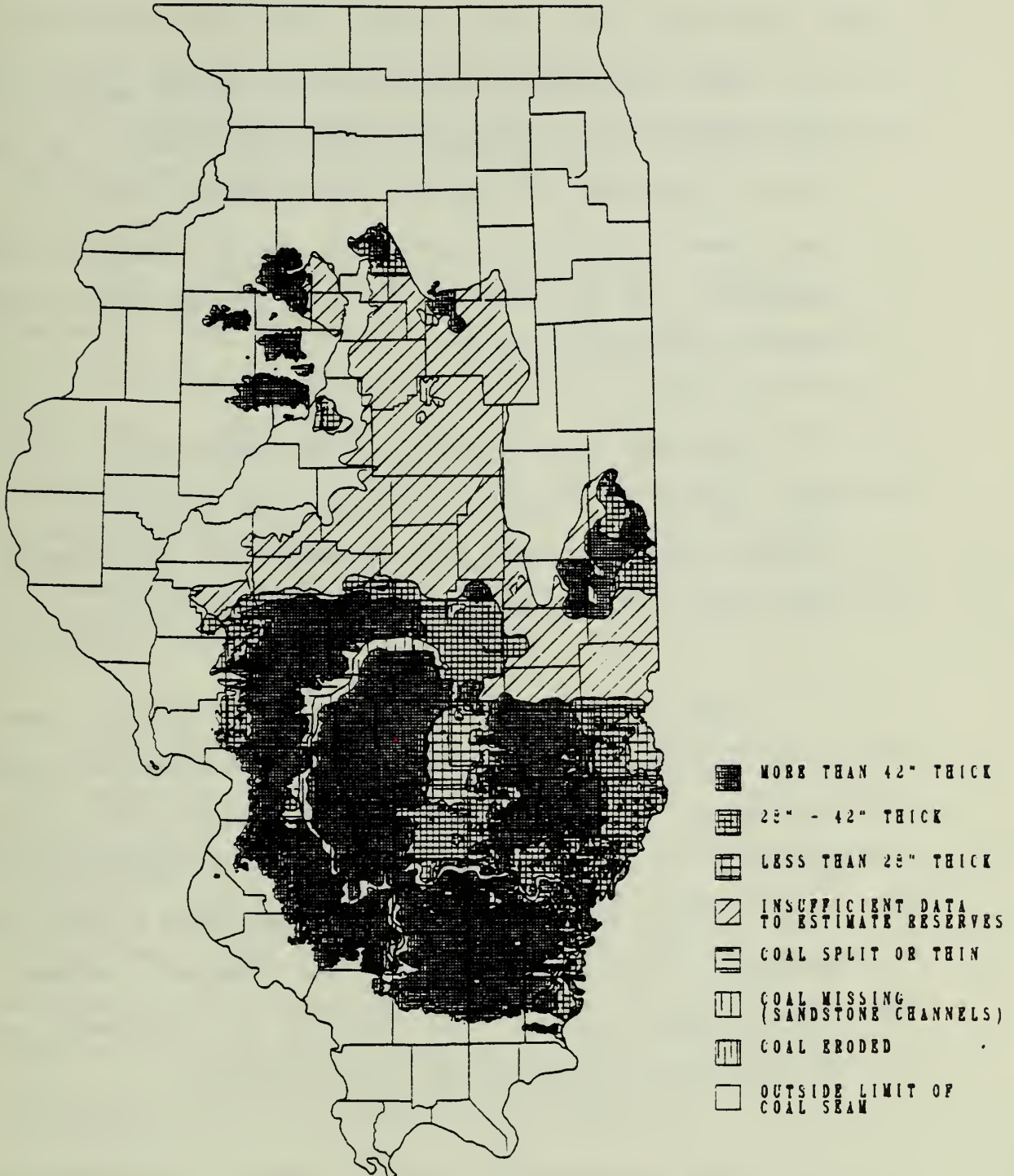
The economics of coal production favor both surface and deep-mine operations. In 1984, 51.1 million tons of Herrin (No.6) were mined, representing 78.3 percent of total Illinois coal production. The average production for deep-mines in 1984 was 1.5 million tons, while strip-mines averaged .8 million tons. There were 15 deep-mines and 3 strip-mines producing more than 1 million tons per year in 1984. Total production from the Herrin (No.6) seam for the period 1960-1984 was approximately 1.1 billion tons, or about 75 percent of all Illinois coal production.

The top five counties with Herrin (No.6) coal

resources are: Montgomery and Washington-3.7 billion tons, each; and Christian, Fayette and Macoupin-3.4 billion tons, each. Currently, there are 36 mines operating in 16 counties mining Herrin (No.6) coal.

MAP 1-2

HERRIN (NO. 6) COAL SEAM



SCALE 1" = 50 MILES

SPRINGFIELD (NO.5) COAL SEAM

The Springfield (No.5) seam is the second largest coal deposit in Illinois. Springfield (No.5) is located in 43 counties of central and southern Illinois. This coal seam correlates with the (No.9) coal of western Kentucky, the Springfield (No.V) of Indiana and the Summit Coal of Iowa and Missouri.

In-place coal resources are estimated at 59 billion tons (32.6% of total Illinois coal resources), with 10 billion tons having a high potential for development. Of this total, about 9 billion tons are deep-minable.

Sulfur content of the Springfield (No.5) ranges from 1 to 5 percent with an estimated 1.9 billion tons having a relatively low to medium sulfur content of 1 to 2.5 percent. In 1984, the sulfur content of deep-mines ranged from .9 to 3.1 percent, with a weighted average of 2.2 percent. In comparison, the sulfur content of surface-mines varied from 2.4 to 3.1 percent, with a weighted production average of 2.9 percent.

The Springfield (No.5) depth of overburden varies from 200 to 1,000 feet. Statewide, the Springfield (No.5)

seam is located 10-130 feet below the Herrin (No.6) deposit. The depth of the overburden for 8 deep-mine operations in 1984 ranged from 140 to 929 feet, with a weighted production depth of 566 feet. In this same year, of 8 strip-mine operations, the weighted production depth was 90 feet, ranging from 33 to 120 feet.

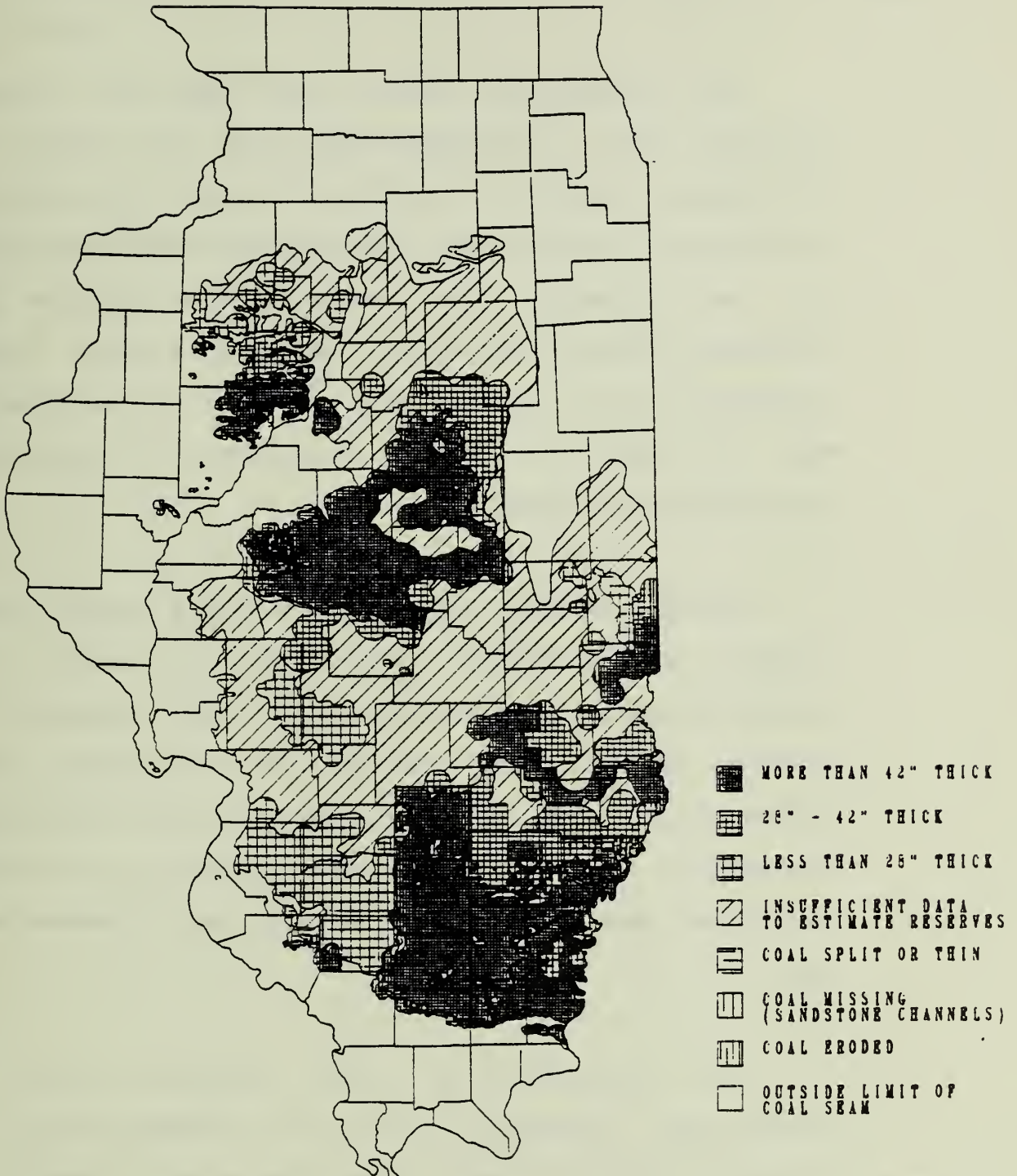
The coal thickness of the Springfield (No.5) resources with a high development potential range from 4.5 to 8 feet; with a production weighted average thickness of 5.9 feet. Coal seam thickness in 1984, from deep-mine operations ranged from 4.7 to 7.5 feet, with a weighted production thickness of 5.7 feet. The seam thickness for surface-mines varied from 3 to 6 feet, with a weighted production thickness of 4.6 feet.

The economics of coal production favor both surface and deep-mine operations. Production for 1984 totaled approximately 13 million tons, or 20 percent of total Illinois coal production. Average production for strip-mines was .337 million tons, while deep-mines averaged .9 million tons. Production, from this seam, for the period 1960 through 1984 was about .3 billion tons, or 20 percent of total Illinois coal production.

The top six counties with Springfield (No.5) coal

resources are: McClean--4 billion tons; Wayne--2.9 billion tons; Jefferson--2.8 billion tons; Logan, Marion and Sangamon, each--2.5 billion tons. In 1984, there were 16 mines in 9 counties mining Springfield (No.5) coal. Map 1-3 shows the location of the Springfield (No.5) coal seam in Illinois.

SPRINGFIELD (NO. 5) COAL SEAM



COLCHESTER (NO.2) COAL SEAM

The Colchester (No.2) coal seam has resources totaling over 15 billion tons (8.3% of Illinois coal resources), placing it third in Illinois coal resources. In Missouri, Kansas and Oklahoma this seam is referred to as the Croweberg Coal Member. The Illinois State Geological Survey estimates that 1.2 billion tons of Colchester (No.2) have a high potential for development. Most of these high potential resources are recoverable by strip-mine operations.

Sulfur content varies from 2.5 to 5 percent, with a portion of Colchester (No.2) low in sulfur. Coal production from one strip-mine in 1984, averaged 2.8 percent sulfur. Coal thickness of the Colchester (No.2) ranges from 2 to 3.5 feet, under variable thickness of overburden. The one strip-mine operating in 1984 had an overburden depth of 47 feet, with a coal thickness of 2.1 feet.

The economics of coal production favor only surface-mine operations from the Colchester (No.2) seam because of coal thickness. The high potential deposits of the Colchester (No.2) are located in the counties of:

Bureau; LaSalle; Grundy; Will; Kankakee; Fulton and McDonough. In 1984, production was located in McDonough County.

DANVILLE (NO.7) COAL SEAM

The Danville (No.7) seam has resources totaling almost 12 billion tons (6.6% of Illinois coal resources). Of this total, approximately 2 billion tons have a high development potential by deep-mine operations. In past years, the Danville (No.7) was extensively mined around Danville, Illinois, but in 1984 only 1 deep-mine and 2 strip-mines were in operation.

Where minable, the Danville (No.7) coal seam varies from 2 to 6 feet in thickness, with a depth of overburden to 150 feet. Of the 3 active mines in 1984, the coal seam thickness varied from 1.8 to 5.5 feet. Depth of overburden ranged from 45 to 110 feet. Sulfur content generally ranges from 3 to 5 percent. No resources are classified as being low in sulfur.

The economics of production favor mining the Danville (No.7) deposits, in conjunction with the Springfield (No.5) and Herrin (No.6) coal seams. In 1984, 2 mines were removing (No.7) coal with (No.5) and/or (No.6) coal. Danville (No.7) coal resources are located in the counties of: Vermilion; LaSalle; Livingston; McClean; Marshall; Clark and Edgar. Production for the

past twenty-five years was 15.4 million tons or 1.1 percent of total Illinois coal production.

SEELYVILLE COAL SEAM

The Seelyville Coal seam has 9.7 billion tons of resources (5.4 percent of Illinois coal resources), with 1.3 billion tons having a deep-mine high development potential, in eastern Illinois. However, the Survey estimates this development may not take place for many years. As the shallow resources of currently mined coal seams become depleted and future markets expand, this seam will ultimately become further explored and developed.

The coal seam thickness of Seelyville varies from 3.5 to 9 feet, with a depth of overburden from 350 to 1,500 feet. Seelyville is located 160 to 240 feet below the Springfield (No.5). Its sulfur content is comparable with other coal resources of Illinois. The Seelyville seam has been mapped in the counties of: Clark; Clay; Crawford; Cumberland; Edgar; Effingham; Jasper; Lawrence; Richland and Shelby. No coal has been extracted from this seam in Illinois; however, this deposit has been extensively mined as the Seelyville Coal Member (III) of Indiana. The Seelyville Coal is believed to be correlative with the Davis and Dekoven Coals, which implies extensive undiscovered resources.

DAVIS AND DEKOVEN COAL SEAMS

The Davis and Dekoven seams are the oldest coal deposits currently being mined in Illinois. Mining is presently located in the counties of: Gallatin, Saline, and eastern Williamson. Coal resources are estimated at 2.9 billion tons of Davis and 2.3 billion tons of Dekoven (1.6% and 1.3% of Illinois coal resources, respectively). Of these totals, approximately .1 billion tons have a surface-mine high development potential.

The coal seam thickness of the Davis/Dekoven varies from 3 to 6.5 feet. Depth of overburden ranges from 30 to 1,500 feet. In 1984, 2 strip-mine operations in Saline County produced from these deposits at a depth of 60 and 80 feet, with seam thicknesses of 3 to 6.5 feet, respectively.

Sulfur content of the Davis/Dekoven ranges from 2.5 to 5 percent-- no reserves are classified as low to medium sulfur. According to Keystone's, 1984 Coal Mine Directory, Peabody's Will Scarlet mine averages 3.7 percent sulfur.

The economics of coal production for the

Davis/Dekoven currently favor surface-mine operations because of depth of overburden and thickness of coal seam. Coal production from these 2 seams for the period 1960-1984 totaled 6.3 million tons, or .4 percent of total Illinois coal production.

LOW TO MEDIUM SULFUR COAL

With the passage of the Clean Air Act in 1970, major changes have occurred in the Illinois coal market. In order to meet the air quality standards of the Act, many end-users of Illinois high sulfur coal converted their existing facilities to low sulfur coal, fuel oil and/or natural gas. The Act also discouraged the use of Illinois coal at new facilities because emission standards for new coal-fired sources were set at a level that could be achieved by low sulfur coal without flue gas desulfurization, commonly referred to as "scrubbers."

In 1977 the U.S. Congress amended the Clean Air Act. Under the amended Clean Air Act, the New Source Performance Standards (NSPS) were released in 1979. Current standards (NSPS), based on the 1977 amendments, reiterated the 1.2 pound per million BTU limit and required 90 percent reduction in sulfur dioxide (SO₂) emissions from all coal or coal derived fuels. A 70 percent reduction is acceptable only if the potential SO₂ emissions are expected to stay below .6 pounds SO₂ per million BTU.

The 1979 NSPS were designed to help high sulfur

coals in new coal-fired facilities. The improvements in efficiency and reliability of scrubbers that have occurred in recent years have had a positive effect on the choice of Illinois coal as a fuel source. In addition, the incremental cost of scrubbers have been off-set by the \$20-\$30 delivered price premium of western low sulfur coal in the mid-western coal market area (1984 Dollars). This premium in delivered price of western coal is primarily because of the high transportation tariffs. However, because of the weak demand for electricity, many new coal-fired facilities have been canceled or postponed and may not take place for many years.

Since about 1955, more than 70 percent of the low sulfur coal production in Illinois was used in blends to make coke for metallurgical purposes. However, in recent years, the use of Illinois low sulfur coal for coking has continued to decrease. For example, in 1972 4.4 million tons were used for coking, while in 1983 only 2.5 million tons. In 1984, it is estimated that only about 1.6 million tons were used for coking (less than 12% of low sulfur coal production). The recession, weak demand in the U.S. economy and an increase in demand for low sulfur coal by the utility industry have been a major contributor to this reduction in use for coking.

With the concern over acid rain legislation at the federal level, more consideration is being given to the development of Illinois low sulfur coal resources for future application. The Illinois State Geological Survey has undertaken numerous activities to identify these resources and potential for development. The Survey estimates that approximately 10 billion tons of deep-minable low to medium sulfur coal resources may be available for future development. Of this total, about 3.7 billion tons have a moderate potential for development. Those counties holding the largest low to medium sulfur coal resources are: Douglas--.6 billion tons; MaCoupin--.4 billion tons; and Christian, Madison, St. Clair, and Vermilion--.3 billion tons, each. These six counties contain approximately 2.2 billion tons (59.5%) of those low to medium sulfur resources with a high potential for development.

Table 1-5 details low and medium sulfur coal resources by county, development potential and quantity for the Herrin (No.6) and Springfield (No.5) coals. Map 4 shows the known distribution of distinguished areas according to low to medium sulfur content greater than 42 inches in thickness. Approximately four percent of the Herrin (No.6) and Springfield (No.5) coal seams are of low to medium sulfur content. According to the Survey, these

resources are located in areas near sandstone filled channels where gray silty shale intervenes between the coal and the overlying black shale and limestone. In these areas where the gray shale deposits are about twenty feet in thickness, the sulfur content is usually less than 2.5 percent. A majority of these resources are located in the Herrin and Springfield coal seams of the Carbondale formation. For many years, these resources have been preferentially mined. [Note 4].

The coal companies discussed in this report mined in 1984: approximately 3.3 million tons with a sulfur content less than 1 percent (5.1% of total Illinois production); 8.1 million tons with a sulfur content of 1 to 1.5 percent (12.4%); 12 million tons with 1.6 to 2.5 percent sulfur (18.4%); 16.6 million tons of 2.6 to 3 percent sulfur (25.4%) and 19.3 million tons with greater than 3 percent sulfur (29.6%).

TABLE 1-5
DEEP-MINABLE
LOW AND MEDIUM SULFUR COAL RESOURCES
MILLION TONS

COUNTY	HERRIN (NO.6) DEVELOPMENT POTENTIAL				SPRINGFIELD (NO.5) DEVELOPMENT POTENTIAL				GRAND TOTAL
	HIGH	MODERATE	LOW	RESTRICTED TOTAL	HIGH	MODERATE	LOW	RESTRICTED TOTAL	
CHRISTIAN	322	101	6	9	438				438
CLARK			26	8	34				34
CLINTON	59	22		6	87				87
COLES		233	326	85	644				644
CUMBERLAND		644	95	29	768				768
DOUGLAS	588	124	137	26	875				875
EDGAR	245	209	322	32	808				808
EDWARDS						33	11	3	58
FRANKLIN	157	1		14	172	25	210	5	445
HAMILTON						141	398	8	669
JEFFERSON	244	100	5	24	373				373
MACCLINTON	382	62		9	453				453
MADISON	266	233	72	70	641				641
MONROE	163	93	3	19	278				278
MOULTRIE		31	134	28	193				193
PERRY	22			1	23				23

TABLE 1-5 CONTINUED

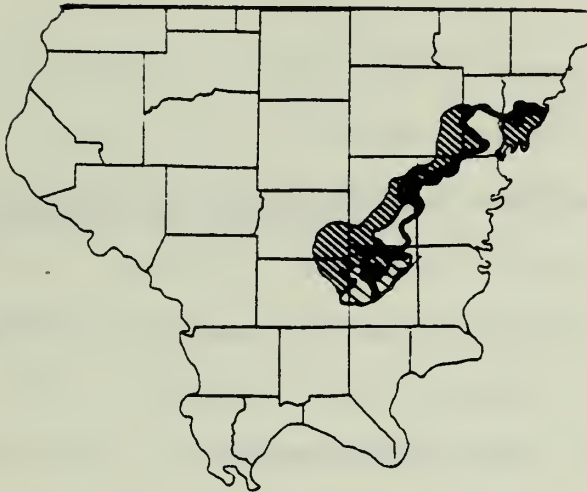
COUNTY	HIGH	MODERATE	LOW	RESTRICTED	TOTAL	HERRIN (NO.6) DEVELOPMENT POTENTIAL					SPRINGFIELD (NO.5) DEVELOPMENT POTENTIAL					GRAND TOTAL
						HIGH	MODERATE	LOW	RESTRICTED	TOTAL	HIGH	MODERATE	LOW	RESTRICTED	TOTAL	
ST. CLAIR	287	65	42	38	432											432
SALINE		222	183	27	432	231	190	11	37	469						469
ST. LOUIS	322	36	28	25	411											411
VERMILION																
WARREN						125	15		99	239						239
WAYNE							33	159	29	221						221
WHITE						20	470	101	56	647						647
WILLIAMSON	3				3	35	246	5	4	290						293
TOTAL	3,060	2,176	1,379	ERD	7,065	ERD	1,573	ERD	ERD	2,866						9,931

SOURCE: Illinois State Geological Survey.

MAP 1-4

LOW TO MEDIUM SULFUR COAL

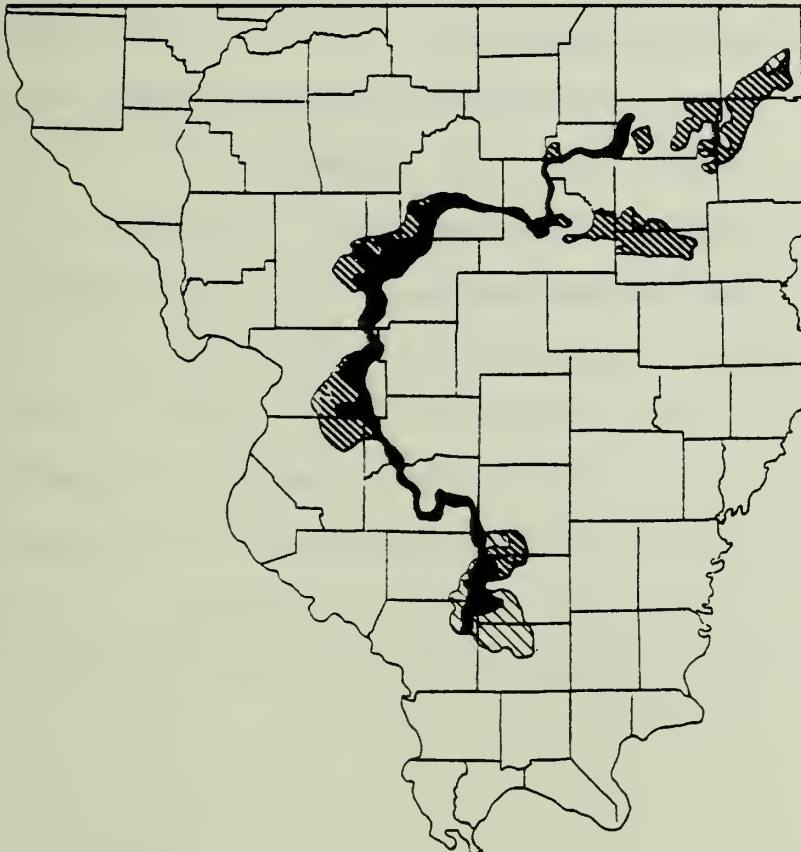
SPRINGFIELD (NO. 5)



- COAL MISSING OR SPLIT,
GALACIA CHANNEL
- ▨ LOW-SULFUR COAL (<2.5%)
THICKER THAN 42"
- ▩ LOW SULFUR COAL
MINED OUT

SCALE 1" = 50 MILES

HERRIN (NO. 6)



- COAL MISSING OR SPLIT,
WALSVILLE CHANNEL
- ▨ LOW-SULFUR COAL (<2.5%)
THICKER THAN 42"
- ▩ LOW SULFUR COAL
MINED OUT

SCALE 1" = 50 MILES

SECTION II: ILLINOIS COAL PRODUCTION

Major Coal Producers In Illinois

Peabody Coal Company

Amax Coal Company

Consolidation Coal Company

Old Ben Coal Company

Monterey Coal Company

Arch Of Illinois

Freeman United Coal Mining Company

Inland Steel Coal Company

Zeigler Coal Company

Sahara Coal Company

MAJOR COAL PRODUCERS IN ILLINOIS

This section of the report discusses Illinois coal production and major Illinois coal producers from a twenty-five year and 1984 perspective. Historically, the Illinois coal industry has been dominated by a few large coal producers. The top ten coal producers for the last 25 years have controlled from 76.2 to 96.2 percent of yearly Illinois coal production. Since 1966, the percentage has been greater than 90 percent. Overall, for the past twenty-five years, the average production by the top ten Illinois coal producers was 84.6 percent. In 1984, the top ten coal operators mined 90.4 percent of total Illinois coal production.

Illinois coal production from 1960 through 1984 totaled 1.4 billion tons, accounting for about 2 percent of Illinois' DRB. Surface-mines totaled 667.8 million tons (47.1% of Illinois coal production) while underground-mines produced 749.5 million tons (52.9%). The twenty-five year average production was 56.7 million tons; with a production low of 43.1 million tons in 1961 and a production high of 65.5 million tons in 1972.

Two hundred and thirteen companies have mined coal in Illinois since 1960. Of the 213, the top ten companies produced approximately 1.2 billion tons, or 84.6 percent of total Illinois coal production. The top four coal companies produced .75 billion tons or 53.6 percent of total production. [Note 5]. Over the study period, the top ten coal producers have stayed about the same. Peabody Coal Company is the largest, followed by Freeman United Coal Mining Company and Old Ben Coal Company. Rounding out the top ten companies are: Arch of Illinois (previously Southwestern Illinois Coal Company); Consolidation Coal Company; Amax Coal Company; United Electric Coal Company; Truax-Traer Coal Company; Zeigler Coal Company and Sahara Coal Company.

Table 2-1 lists the top ten coal producers for the period 1960-1984 by: yearly production; total production by individual producer; total production of those coal producers listed, by year; and percent of total coal production by those coal producers listed to total Illinois coal production. For example, the eight coal operators listed for 1984 produced 49.7 million tons, representing 76.1 percent of total Illinois coal production for this same period. No figures are presented for United Electric Coal Company after 1974 and Truax-Traer Coal Company after 1970 because General

TABLE 2-1
TOP TEN ILLINOIS COAL PRODUCERS
MILLIONS OF TONS
1960-1984

YEAR	EMBODY	FREEMAN UNITED	OLD BEN	ARCH OF ILLINOIS	CONSOL.	MAX	UNITED ELECTRIC	TRUNK- TRAER	ZETZLER	SWARA	TOTAL	% OF TOTAL PRODUCTION
TOTAL	330.9	169.0	135.0	115.5	109.4	93.1	71.3	57.9	54.0	48.7	1,184.8	84.6
1984	11.6	5.5	7.2	5.6	7.8	7.9			2.7	1.4	49.7	76.1
1983	10.4	5.5	5.9	5.4	7.8	8.9			1.9	1.3	47.1	80.7
1982	11.4	7.5	5.9	4.7	9.9	7.9			2.4	1.4	51.1	83.2
1981	9.5	6.3	5.2	4.4	7.8	5.9			2.9	1.2	43.2	83.4
1980	11.6	7.1	6.1	5.5	8.6	8.1			4.0	1.4	52.4	83.8
1979	12.2	7.4	5.5	4.7	9.0	6.5			3.8	1.4	50.5	84.9
1978	10.5	5.8	3.9	4.2	8.0	4.8			3.3	1.2	41.7	85.6
1977	11.1	6.8	4.8	4.1	8.2	5.1			4.0	1.6	45.7	84.8
1976	12.9	6.1	4.9	5.0	8.1	6.0			4.1	1.9	49.0	84.3
1975	15.2	6.5	5.0	5.0	7.3	6.0	(c)		4.0	1.9	50.9	85.5
1974	14.8	4.6	5.4	5.6	6.4	5.1	2.4		3.3	2.2	49.8	85.7
1973	15.1	5.3	6.5	5.9	6.5	4.7	3.4		2.9	2.3	52.6	85.5
1972	15.9	6.4	6.3	5.9	7.8	4.5	4.0		2.7	2.2	55.7	85.0
1971	13.7	7.4	6.4	5.0	6.2	2.0	4.1	(a)	2.5	2.3	49.6	84.9
1970	20.2	8.4	7.3	5.7		2.2	5.7	6.2	.8	2.4	58.9	90.8
1969	20.6	8.4	7.3	6.8		2.2	5.6	6.5	1.0	2.8	61.2	94.4
1968	20.7	7.8	5.2	6.9		2.5	5.3	7.0	.9	2.5	58.8	94.7
1967	15.1	8.4	6.0	7.5		2.4	5.7	6.9	.9	2.6	55.5	85.6
1966	14.0	7.7	6.1	6.8		.4	5.9	6.9	.8	2.5	51.1	86.2
1965	12.6	5.8	4.7	5.1		(b)	5.3	4.4	.8	2.4	41.1	74.1
1964	12.4	7.0	4.5	1.8			5.8	4.8	.9	2.3	39.5	76.1
1963	11.2	6.9	4.1	1.0			4.9	3.3	.9	2.1	34.4	71.1
1962	9.4	7.6	3.8	1.1			4.8	4.1	.9	1.9	33.6	74.2
1961	9.4	6.6	3.5	.9			4.4	3.6	.8	1.8	31.0	72.4
1960	9.4	6.2	3.5	.9			4.0	4.2	.8	1.7	30.7	70.3

(a) Consolidation Coal Company purchased Trunk-Traer in 1971.

(b) Amax Coal Company started producing in 1966 under Aysshire, a division of Amax.

(c) United Electric was joined with Freeman Coal Company.

Dynamics Corporation increased their ownership of United Electric (now Freeman United Coal Mining Company) to 100 percent and Truax Traer was purchased by Consolidation Coal Company.

Table 2-1 further shows that the top ten coal producers, for the twenty-five year period of this study, have generally increased their overall production performance. In 1960, the top ten producing companies accounted for 70.3 percent of total Illinois coal production, while in 1968 the percentage of coal production by the top ten companies peaked at 94.7 percent. Since then, the percentage of total Illinois production by those coal producers listed have stayed relatively the same at about 80 percent.

It must be remembered not to compare Table 2-1 with Table 2-2. Table 2-1 is a comparative analysis of the major coal producers from a twenty-five year coal production perspective. Table 2-2 lists the top ten coal producers operating in 1984. The companies listed in Table 2-1 are not identical to the coal producing companies listed in Table 2-2.

In 1984 there were 24 coal companies operating the 53 mines in Illinois. Coal production totaled 65.3

million tons, valued at \$2 billion. The top four coal producers accounted for 34.5 million tons (52.8% of Illinois coal production), while the top ten companies produced 59 million tons (90.4%). The largest coal producer in 1984, continued to be Peabody Coal Company with 17.7 percent of total Illinois coal production, followed by Amax Coal Company at 12.1 percent, Consolidation Coal Company at 12 percent and Old Ben Coal Company with 11 percent. Table 2-2 lists the top ten Illinois coal producers in 1984 by: holding company; Illinois coal production and percent of production; and U.S. rank based on total U.S. coal production. For example, Peabody Coal Company was the largest U.S. coal producer (64.4 million tons) and largest Illinois coal producer (11.6 million tons), representing 7.3 percent of U.S. coal production and 17.7 percent of Illinois coal production. Overall, the top ten coal companies operating in Illinois produced 214.5 million tons nationally, or 24.2 percent of U.S. coal production.

Of the top ten Illinois coal producing companies in 1984, six were among the top 25 U.S. coal producing companies. As shown in Table 2-2, seven of the firms are mining coal in more than one state, while three firms are producing only in Illinois. This can be seen by comparing Illinois coal production and U.S. coal production to see

TABLE 2-2
TOP 10 ILLINOIS COAL PRODUCERS
1984

HOLDING COMPANY	COAL OPERATOR	ILLINOIS PRODUCTION	% IL PROD	U.S. PRODUCTION	% U.S. PROD	U.S. RANK
PEABODY HOLDING AMAX, INC.	PEABODY COAL AMAX COAL	11,554,650 7,918,024	17.7 12.1	64,400,000 41,400,000	7.3 4.7	1 3
DUPONT STAND. OIL OHIO	CONSOL COAL OLD BEN COAL	7,823,292 7,158,141	12.0 11.0	46,700,000 14,600,000	5.3 1.6	2 13
EXXON ARCH MINERAL	MONTEREY COAL ARCH OF ILLINOIS	5,679,400 5,623,318	8.7 8.6	23,200,000 11,000,000	2.6 1.2	7 24
GENERAL DYNAMICS INLAND STEEL CO.	FREEMAN UNITED INLAND STEEL COAL	5,476,487 3,309,595	8.4 5.1	5,476,487 3,309,595	.6 .4	N.A. N.A.
HOUSTON NAT.GAS KENELLIS COAL	ZEIGLER COAL KENELLIS COAL	2,670,658 1,764,802	4.1 2.7	2,670,658 1,764,802	.3 .2	N.A. N.A.
OTHER COAL PRODUCERS		6,310,824	9.6	675,624,000	75.9	
TOTAL		65,289,191	100.0	890,145,542	100.0	

N.A. denotes data not available.

SOURCE: Illinois Department of Mines and Minerals, and Coal Age.

if there is a difference in production. Table 2-2 also shows the market power these ten coal producers have in Illinois. Since these ten firms account for about 25 percent of U.S. coal production, they also theoretically have some level of market dominance at the national level. The six companies with a national ranking, total 201.3 million tons of U.S. coal production, of which their Illinois coal production represented 23.1 percent of their overall U.S. production.

All of the major coal companies and their respective holding companies operating in Illinois are market classified as either: consortium; diversified; coal; petroleum; non-ferrous metals; iron and steel; aircraft and missiles; or, gas companies and systems. Of the major coal companies operating in Illinois, eight have holding companies headquartered outside of Illinois, while two have headquarters within the State. Table 2-3 shows the name of the coal company; holding company ownership, location and percent of ownership; state(s) where coal production takes place and holding company market classification.

A description of coal production, mine characteristics, coal characteristics, employment and brief history of most of the major coal companies

operating in Illinois follows.

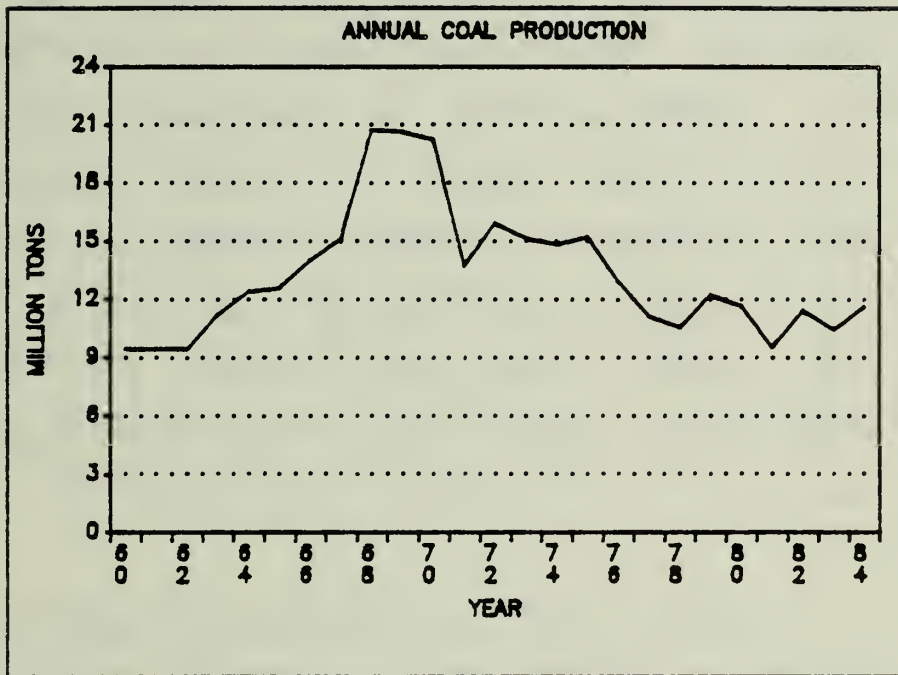
TABLE 2-3
MAJOR ILLINOIS CONL HOLDERS
COMPANY, OPERATIONS, HOLDING COMPANY, OWNERSHIP AND CLASSIFICATION
1984

CONL COMPANY	OPERATING IN:	HOLDING COMPANY	% OWNERSHIP	HOLDING COMPANY LOCATION	MARKET CLASSIFICATION
PEABODY CONL	ARIZONA, COLORADO, ILLINOIS, INDIANA, KENTUCKY, MISSOURI, MONTANA, OHIO, OKLAHOMA AND WEST VIRGINIA	PEABODY HOLDING CO. IS OWNED BY: NEWMONT MINING WILLIAMS COMPANY BECHTEL CORPORATION BOEING COMPANY EQUITABLE LIFE	30.7 30.7 16.8 16.8 5.0	ST. LOUIS, MISSOURI	CONSORTIUM
MAX CONL	ILLINOIS, INDIANA, KENTUCKY AND MONTANA	MAX, INC (STANDARD OIL OF CALIFORNIA OWNS 20.5% OF MAX, INC)	100.0	GREENWICH, CONNECTICUT	NONFERROUS METALS
CONSOLIDATION CONL	ILLINOIS, N. DAKOTA, OHIO, PENNSYLVANIA, TENNESSEE, UTAH AND WEST VIRGINIA	DUPONT CORPORATION	100.0	WILMINGTON, DELAWARE	DIVERSIFIED
OLD BEN CONL	ILLINOIS, INDIANA, WEST VIRGINIA	STANDARD OIL OF OHIO	100.0	CLEVELAND, OHIO	PETROLEUM

TABLE 2-3 CONTINUED

COAL COMPANY	OPERATING IN:	HOLDING COMPANY	% OWNERSHIP	HOLDING COMPANY LOCATION	MARKET CLASSIFICATION
FREDMAN UNITED COAL MINING	ILLINOIS	GENERAL DYNAMICS	100.0	ST. LOUIS, MISSOURI	AIRCRAFT AND MISSILES
ARCH OF ILLINOIS	ALABAMA, ILLINOIS, KENTUCKY AND WYOMING	ARCH MINERAL CORP (ARCH IS OWNED BY ASLAND OIL AND HUNT FAMILY INTERESTS 50% EACH)	100.0	ST. LOUIS, MISSOURI	PETROLEUM
MONTBERRY COAL	ILLINOIS, WEST VIRGINIA, AND WYOMING	EXXON COAL (A SUBSIDIARY OF EXXON CORPORATION)	100.0	NEW YORK, NEW YORK	PETROLEUM
INLAND STEEL COAL	ILLINOIS, PENNSYLVANIA AND WEST VIRGINIA	INLAND STEEL CORP	100.0	CHICAGO, ILLINOIS	IRON AND STEEL
ZEIGLER COAL	ILLINOIS	HOLSTON NATURAL GAS CORPORATION	100.0	HOLSTON, TEXAS	GAS COMPANIES AND SYSTEMS
SWANRA COAL	ILLINOIS	PRIVATELY OWNED	100.0	CHICAGO, ILLINOIS	COAL

SOURCE: Moody's Industrial Manual and Keystone Coal Industry Manual.



PEABODY COAL COMPANY

PEABODY COAL COMPANY

Peabody Coal Company was incorporated in Illinois in 1890. On May 28, 1928, Peabody was re-incorporated by consolidation of Peabody Coal Company and other coal companies. This consolidation was with other Illinois coal companies owned by Commonwealth Edison Company, Public Service Company of Northern Illinois and Middle West Utilities. In return, Peabody was given long-term coal contracts with each of these utilities. In July of 1955, Peabody, the eighth largest U.S. coal producer, merged with Sinclair Coal, the third largest U.S. coal producer.

Peabody was sold to Kennecott Copper Corporation on March 28, 1968. Eight years later, the Federal Trade Commission ruled that Kennecott's ownership of Peabody was in violation of the Clayton Anti-Trust Act. On June 30, 1977, Peabody Holding Company, Incorporated purchased Peabody Coal Company for \$1.1 billion. Peabody has been the largest U.S. coal producer since 1970, with sales in 1984 of \$1.5 billion and assets totaling \$1.7 billion.

Peabody Holding Company, Incorporated is jointly owned by: Newmont Mining Company 30.7%, The Williams

Company 30.7%; Bechtel Corporation 16.8%; Boeing Company 16.8%; and The Equitable Life Assurance Society 5%. Newmont Mining Company of New York is the 362nd largest U.S. industrial corporation with 1984 sales totaling \$.8 billion and assets of \$2.1 billion. Boeing Corporation headquartered in Seattle, Washington was the 29th largest U.S. industrial corporation in 1984 with \$10.4 billion in sales and \$8.5 billion in assets. Based on assets, Equitable Life Assurance Society of New York was the third largest U.S. insurance company with \$44.5 billion. The Williams Companies headquartered in Tulsa, Oklahoma had 1983 revenues totaling \$2.2 billion and \$1 billion in assets. No figures were available for Bechtel Corporation which is located in San Francisco, California.

Peabody Coal Company's corporate office is located in St. Louis, Missouri. Additionally, Peabody has five separate geographical divisions responsible for the production of coal and support activities. The Arizona Division is located in Flagstaff, Arizona and responsible for coal operations in Arizona; the Eastern Division is in Henderson, Kentucky and responsible for coal operations in western Kentucky and Ohio; the Illinois Division is located at Fairview Heights, Illinois and manages coal operations in Illinois, West Virginia, Oklahoma and Missouri; the Indiana Division at Evansville, Indiana

oversees the activities in west-central and southern Indiana; and the Rocky Mountain Division in Denver, Colorado manages coal production in Colorado and Montana.

Peabody Coal Company has coal reserves and production in Arizona, Colorado, Illinois, Indiana, Kentucky, Missouri, Montana, Ohio, Oklahoma and West Virginia. Reserves total approximately 8.6 billion tons which Peabody classifies as "economically recoverable coal, enough to last the company 142 years at present mining rates." Approximately 50 percent of these reserves are recoverable by surface-mine operations and the remaining 50 percent by deep-mine operations. Within the Illinois Coal Field Basin, reserves are estimated at 2.3 billion tons in Illinois; .8 billion tons in Kentucky and .6 billion tons in Indiana. Keystone's 1984 Coal Mine Directory ranks Peabody fifth in privately held coal reserves. [Note 6].

Peabody has been the largest coal producer in the United States since 1970, and for much longer, the largest coal producer in Illinois. U.S. coal production in 1984 totaled 64.4 million tons or 7.3 percent of U.S. coal production. According to Peabody data, approximately 70 percent of this production was from 22 surface-mines and 30 percent from 14 underground-mines. Almost 97 percent

of its production is committed to long term contracts. Ninety-four percent of production is sold to 55 electric utilities in 16 states, while the remaining 6 percent is sold to industry.

Peabody's coal production in Illinois since 1960, totaled 330.9 million tons or 23.6 percent of all Illinois coal production. Peabody's coal production from 16 mines peaked in 1968 at 20.7 million tons, representing 33.2 percent of Illinois coal production. Since that time, the tonnage and percent of total Illinois coal production have decreased to their present level of 11.4 million tons and 17.7 percent of Illinois coal production. This is due to Peabody Coal Company selling five coal operations in 1970 to Midland Coal Company, a division of Asarco. Currently, Peabody's Illinois coal production is from 5 deep-mines and 3 surface-mines, with a mine labor force of 2,715.

The 2,715 mine employees of Peabody represented 18.3 percent of total Illinois mine employment, for 1984. Average tons of production per deep-mine employee per year was 4,035, or 13.7 tons per man-day, while surface-mine employees averaged 5,564 tons per year, or 19 tons per man-day. Statewide, from all Illinois coal production in 1984, the average tons of production per mine employee for deep-mines was 3,679/year, or 13.7 tons per man-day.

Surface-mines averaged 6,423 tons/year, or 20.3 tons per man-day.

Table 3-1 shows the characteristics of the Illinois mines in the Peabody system. Included in the Table are: the 8 active mines; 1984 coal production; mine employment; 1984 mine value in millions of dollars; coal seam member from which the coal is extracted; depth in feet from surface to coal seam; thickness of coal seam in feet and inches; % sulfur; % moisture; % ash; % volatile matter; % fixed carbon and BTU's per pound of coal.

A description of Peabody's Illinois mines operating in 1984 follows.

Mine No.10 is a deep-mine located in Christian County at Pawnee. No.10 has an annual mine capacity of approximately 4 million tons, with reserves of 160 million tons. [Note 7]. In 1984, it was the largest Illinois mine in the Peabody system, the second largest Illinois underground mine and the fourth largest producing mine in Illinois. Of the more than 3,400 coal mines nationally, No.10's coal production ranked in the top sixty. Mine No.10's production in 1984 of 3 million tons, accounted for 26.1 percent of Peabody's Illinois coal production,

while No.10's employment represented 36.8 percent of Peabody's Illinois mine employment. These percentage differences are mainly because of deep-mines being a more labor intensive industry than surface-mines. The production per mine employee in 1984 averaged 3,010 tons, or 9.5 tons per man-day. [Note 8]. Mine No.10 opened in 1952, with production through 1984 of 147.5 million tons; since 1960--124.1 million tons. The mine utilizes a room and pillar coal removal technique (a portion of the coal is left as pillars to support the cavity and prevent surface subsidence). This process allows for approximately 50 percent of the total coal resource to be removed. One hundred percent of the coal is washed on-site utilizing a "Baum Type Jig Plant." [Note 9]. Mine No.10 is a mine-mouth which supplies Commonwealth Edison Company's Kincaid Station, under long-term contract. The coal is transported approximately 1 mile via conveyor belt.

Baldwin is a deep-mine located in Randolph County at Marissa, with an annual production capacity of 2.2 million tons. Coal production for 1984 totaled approximately 2.2 million tons (100% of mine capacity); an increase of .2 million tons from 1983. This mine production represented 19.1 percent of Peabody's Illinois coal production, while

Baldwin's mine employment accounted for 16.2 percent of Peabody's Illinois mine employment. In 1984, the average production per mine employee was 5,027 tons per year, or 18.4 tons per man-day. Pillar and room coal removal is utilized. Baldwin is the second largest mine in Peabody's Illinois system and the thirteenth largest Illinois mine. The mine opened in 1972 and has mined 20.4 million tons of coal through 1984. The Baldwin, River King No.6 and Marissa mines use a central coal preparation facility. The Randolph Preparation Plant is one of the most sophisticated and productive preparation plants in the United States. Most of the cleaned coal is transported approximately three miles by rail to Illinois Power Company's Baldwin station, or barged to Associated Electric Co-op in Missouri, under long-term contracts. Peabody Coal Company Railroad transported 1.8 million tons and Kaskaskia River Port Railroad moved .4 million tons in 1984.

River King Underground No.1 is located in St. Clair County at Freeburg. No.1 has an annual production capacity of almost 1.3 million tons. Coal production of 1.6 million tons in 1984 represented 123 percent of this capacity. (In the short-run, a mine can produce over 100 percent capacity by adding additional production in-puts such as employees, number of shifts, etc. As shown in

Note 7, this figure is not absolute and can vary over time). No.1's coal production accounted for 13.9 percent of Peabody's Illinois coal production, while No.1's employment represented 12 percent of Peabody's Illinois mine employment. The average tons of production per mine employee per year was 4,911, or 20.8 tons per man-day in 1984. Coal is removed utilizing pillar and room technique. Production began in 1970 with to-date production of 22.6 million tons. Transportation of the coal is by rail to Dairyland Power Co-op in Wisconsin and Interstate Power Company in Iowa, under long-term contract. Illinois Central Gulf Railroad transported 1.5 million tons in 1984.

Marissa is a deep-mine located in Washington County at Marissa. Annual mine capacity is approximately 1 million tons, with 1.5 million tons produced in 1984. This coal production represented an increase of 32.8 percent over 1983. Employment at this mine, represented 7.6 percent of Peabody's Illinois employment, while its output accounted for 12.8 percent of Peabody's Illinois production. Average tons of production per mine employee totaled 7,160 in 1984, or 25.6 tons per man-day. Coal is removed using pillar and room technique. The mine opened in 1979 with production through 1984 of 4.9 million tons. The mine will eventually be joined by two additional

underground mines to provide for future growth demands. As noted earlier, coal is washed at the Randolph central processing plant. Coal is transported by rail and barge from the central processing plant to various utilities. In 1984, 1.4 million tons were transported by Illinois Central Gulf Railroad.

Eagle No.2 is a deep-mine located in Gallatin County at Shawneetown. Annual coal production capacity of No.2 is approximately 1.0 million tons. Eagle No.2 in 1984 produced 1.1 million tons, up from .9 million tons in 1983. Production at No.2 in 1984 represented 9.3 percent of Peabody's Illinois production, while No.2's employment accounted for 12.9 percent of Peabody's Illinois mine employment. The average production per mine employee in 1984 was 3,062 tons per year, or 9.5 tons per man-day. No.2 is the only active Peabody mine producing from the Springfield No.5 coal seam. Coal is mined utilizing pillar and room removal technology. Eagle No.2 opened in 1969 with total production through 1984 of 10.6 million tons. In 1984, 100 percent of the coal was cleaned by a "Jig Plant." The coal is transported by water to Gulf Power Company in Florida under long-term contract.

River King No.6 is a strip-mine located in Randolph County at Marissa. No.6 has an annual production capacity

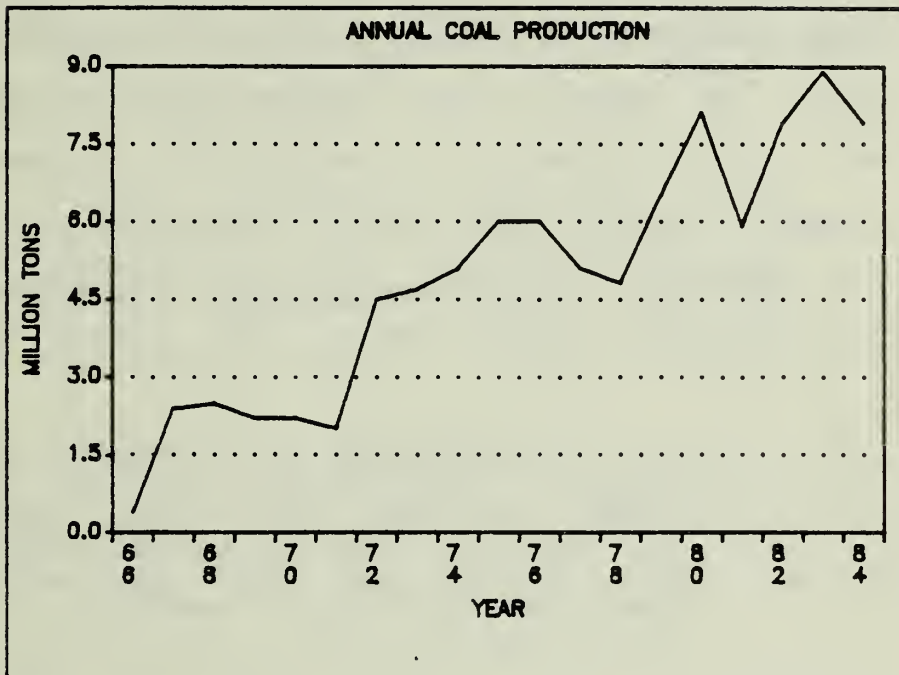
of 2.7 million tons. The 1984 production of .9 million tons represented 33 percent of this capacity. The mine's production for 1984 increased by about .4 million tons, from 1983. No.6's production represented 7.6 percent of Peabody's Illinois production, while No.6's employment accounted for 4.8 percent of their employment. The average tons of production per mine employee in 1984 was 6,746, or 24.6 tons per man-day. Coal operations began in 1957 with production totaling 19.5 million tons. As of 1984, the mine had approximately 8 years of remaining activity. No.6 has a stripping ratio of 17 to 1, or for every foot of coal there is 17 feet of overburden. River King No.6 is the largest surface-mine in the Peabody system in Illinois. The coal is transported by rail and utilized by Illinois Power Company's Baldwin Station and Associated Electric Co-op of Missouri. Peabody Coal Company Railroad moved .9 million tons of coal in 1984.

Will Scarlet is a surface-mine located in Saline County at Stonefort. The mine has an annual production capacity of .7 million tons, with coal production in 1984 representing 95 percent of this capacity. Coal production from Will Scarlet accounted for 5.7 percent of Peabody's production in Illinois, while its employment represented 6.6 percent of Peabody's Illinois employment. Coal production per mine employee averaged 3,725 tons in 1984,

or 15.2 tons per man-day. The stripping ratio is 24:1. Will Scarlet is the only Peabody mine producing from the Davis/Dekoven coal seam. As Table 3-1 indicates, this coal has the highest sulfur and BTU content in Peabody's Illinois system. Will Scarlet started operating in 1953, with production through 1984 of 23.3 million tons. One hundred percent of the coal is prepared utilizing a "Link Belt Baum Type Jig Plant." The coal is transported by rail, barge and/or truck to either Mississippi Power Company, or Associated Electric Co-op in Missouri. Illinois Central Gulf Railroad moved .3 million tons in 1984.

River King No.3 is a surface-mine located in St. Clair County at New Athens. Production for 1984 totaled .6 million tons, representing 80 percent of annual production capacity. No.3's coal production accounted for 5.5 percent of Peabody's production in Illinois, while its employment represented 3.1 percent of Peabody's Illinois mine employment. Coal production per mine employee averaged 7,631 tons in 1984, or 18 tons per man-day. The mine opened in 1957 with production through 1974 of 65.8 million tons. Since 1974, No.3 has produced 15.3 million tons. (Prior to March 1976, No.3 was called River King Strip. In 1976, the mine was split into two mines--River King No.3 and River King No.6). The mine is scheduled to

close in 1985. No.3's stripping ratio is 13:1. River King No.3 and River King Underground No.1 use a central coal preparation plant (McNally Pittsburg Plant) at Freeburg. Coal is transported via rail to Dairyland Power Co-op in Wisconsin and Interstate Power Company in Iowa, under long-term contract. Illinois Central Gulf Railroad transported .6 million tons in 1984.



AMAX COAL COMPANY

AMAX COAL COMPANY

Amax Coal Company was formed on October 31, 1969 through the merger of Ayrshire Collieries Corporation. Amax exchanged one share of series A convertible preferred stock for each of the 790,891 Ayrshire common shares. Amax Coal Company is a subsidiary of AMAX, Inc. The largest common stockholder of AMAX, Inc. is Standard Oil of California with 20.5 percent. According to AMAX, Inc.'s annual report:

"it is a supplier of minerals and energy to America and the world. The Company explores for, mines, refines and sells a wide variety of minerals and metals and has substantial interests in coal, petroleum and natural gas."

Amax, Inc. is the 153rd largest U.S. industrial corporation with 1984 sales of \$2.4 billion and assets totaling \$4 billion. Standard Oil of California is the 11th largest U.S. industrial corporation with sales in 1984 totaling \$26.9 billion and assets valued at \$25.7 billion.

AMAX, Inc. is headquartered at AMAX Center, Greenwich, Connecticut while Amax Coal Company is located in Indianapolis, Indiana.

Amax Coal Company has coal reserves and/or production in Illinois, Indiana, Kentucky and Wyoming. Coal reserves are estimated at 3.7 billion tons, with 2.3 billion tons located in the Midwest and 1.4 billion tons in the West. In the Illinois counties of St. Clair; Randolph; Jefferson; Franklin; Williamson; Saline; Pope; Massac and Perry, Amax has reserves of approximately 180 million tons. AMAX defines coal reserves as:

"those estimated quantities which geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known coal areas under existing operating methods."

Assuming Amax's 1984 coal production of about 40 million tons per year, Amax has a 93 year supply of coal. Keystone's 1984 Coal Mine Directory ranks Amax eleventh in privately held coal reserves.

Amax Coal Company ranked third in U.S. coal production and second in Illinois coal production for 1984. U.S. coal production by Amax for this same year totaled 41.4 million tons, representing 4.7 percent of U.S. coal production. Amax's Illinois coal production totaled 7.9 million tons, or 12.1 percent of total Illinois coal production.

Total coal production in Illinois, 1960-1984,

including production from Ayrshire Coal Company and Amax Coal Company was 93.1 million tons. This figure represents 6.7 percent of all Illinois coal production for this same period and ranks Amax sixth in overall production. Amax first became a major coal producer in 1967 when it produced 2.4 million tons (3.7% of Illinois coal production). Since that time, Amax has shown almost continuous growth to its present level of 7.9 million tons. However, Amax's 1984 Illinois production was down by 1 million tons from 1983 because of the closing of the Sunspot mine. Today, Amax is producing from 2 surface-mine (67.9% of production) and 1 deep-mine (32.1%) in Illinois. These three mines ranked fifth, sixth and seventh in Illinois mine production. Amax's share of Illinois coal production has increased to 12.1 percent.

Currently, Amax's Illinois mine employment is 1,625, representing 11 percent of total Illinois mine employment. This figure is down by 237 mine employees from 1983. Average production per deep-mine employee in 1984 was 2,899 tons per year, or 12.2 tons per man-day; while surface-mine employees averaged 7,195 tons, or 23.4 tons per man-day. As noted earlier, the statewide averages were: deep-mine--3,679 tons per year, or 13.7 tons per man-day and surface-mines--6,423 tons per year,

or 20.3 tons per man-day.

Amax's three Illinois mines operating in 1984 were.

Leahy is a strip-mine located in Perry County at Campbell Hill. The Leahy mine is the largest producing mine in Amax's Illinois system, the fifth largest mine in Illinois and ranked in the top sixty, nationally. It has an annual mine capacity of 2.8 million tons, with production in 1984 of 2.8 million tons. Leahy's coal production accounted for 35.4 percent of Amax's Illinois production, while Leahy's employment represented 23.6 percent of Amax's Illinois employment. Coal production per mine employee averaged 7,307 tons in 1984, or 23.5 tons per man-day. The mine has a stripping ratio of 7:1. Leahy's coal production began in 1971 with to-date production of 33.9 million tons. A "McNally Pittsburg Jig Plant" is used for cleaning the coal. The coal is transported by rail to Union Electric Company of Missouri, under long-term contract. In 1984, Missouri Pacific Railroad transported 2.4 million tons and Illinois Central Gulf Railroad moved .4 million tons.

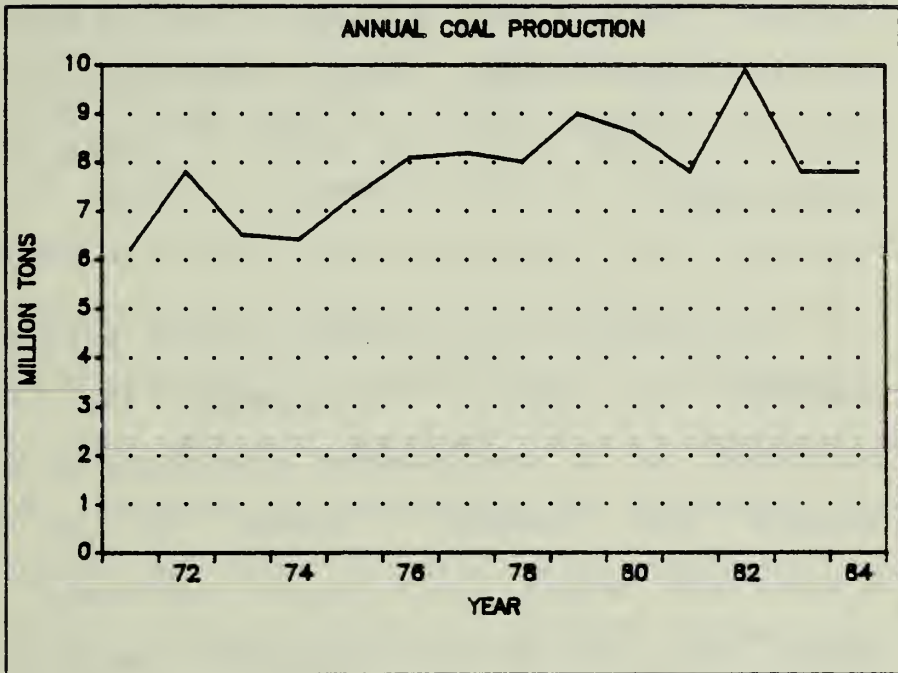
Characteristics of the three mines and coal quality are shown in Table 3-2. As with Peabody, the same type

of data is shown whenever available. The interesting point of Table 3-2 is that all three mines are producing coal with less than 2.6 percent sulfur. One mine is producing a low sulfur coal of 1.3 percent sulfur, while two mines are producing coal that is less than 2.6 percent sulfur, which classifies as a medium sulfur coal. BTU's per pound of coal are relatively high, ranging from 10,700 to 11,900.

Delta is a strip-mine located in Williamson County at Marion. The mine has an annual mine capacity of 2.3 million tons, with coal reserves in excess of 45 million tons. Production in 1984 of approximately 2.6 million tons represented 113 percent of Delta's annual capacity. This production accounted for 32.4 percent of Amax's Illinois production, while Delta's employment represented 22.3 percent of Amax's Illinois mine employment. Coal production per mine employee was 7,074 tons in 1984, or 21.3 tons per man-day. The mine has a stripping ratio of 19:1. Mine production first began in 1946 with production totaling 42.4 million tons--since 1960, 27.4 million tons. For 1984, it was the sixth largest coal mine in Illinois. One hundred percent of the coal is washed using a "McNally Pittsburg Jig Plant." Coal is sold under long-term contract or spot market to Central Illinois Public Service, Consumers Power Company of

Michigan, Florida Power Company, Tampa Electric of Florida and Wisconsin Electric Power. The coal is transported by rail or truck. Illinois Central Gulf Railroad transported 1.8 million tons in 1984.

Wabash is a deep-mine located in Wabash County at Keensburg. The 1984 production of 2.5 million tons represented 100 percent of Wabash's annual mine capacity. The Wabash mine was the seventh largest producing mine in Illinois. Mine production in 1984 represented 32.1 percent of Amax's Illinois production, whereas mine employment accounted for 54 percent of Amax's Illinois mine employment. Average production per mine employee in 1984 totaled 2,899 tons, or 12.3 tons per man-day. The mine opened in 1973 with production through 1984 totaling 19.9 million tons. As seen in Table 3-2, the Wabash mine has a quality coal, with sulfur of approximately 1.3 percent and BTU/lb of 10,700. The coal is washed with a "McNally Pittsburg Plant." Rail is used in transporting the coal to Public Service Company of Indiana, under long-term contract. Conrail transported 2.5 million tons in 1984.



**CONSOLIDATION
COAL COMPANY**

CONSOLIDATION COAL COMPANY

Consolidation Coal Company (CONSOL) became an active Illinois coal producer in 1971 when it purchased Truax-Traer Coal Company. Truax-Traer was the fourth largest Illinois coal company in 1970 (9.6% of production) and the eighth largest Illinois coal company in this study (58.7 million tons and 4.3% of total Illinois coal production).

Continental Oil Company (CONOCO) purchased CONSOL on September 15, 1966. On September 30, 1981 CONOCO was purchased as a wholly-owned subsidiary of E.I. DuPont De Nemours and Company. DuPont is an international diversified company with major petroleum, coal, other energy and raw material resources. According to Fortune magazine, in 1984 DuPont was the seventh largest U.S. industrial corporation with assets of \$24.1 billion and sales of \$39.5 billion. DuPont Corporation is headquartered in Wilmington, Delaware.

CONSOL has U.S. coal reserves of 13.7 billion tons, ranking second in privately held coal reserves. These coal reserves are located in approximately every coal region of the U.S. and Alberta, Canada. CONSOL's Illinois

coal reserves are estimated at 3.1 billion tons, representing 22.6 percent of its total coal reserves.

In recent years, CONSOL has been the second largest U.S. coal producer, with production in 1984 totaling 46.7 million tons and 5.3 percent of U.S. coal production. CONSOL has five regions: the Western Region is located in Englewood, Colorado with responsibility over coal production in New Mexico, North Dakota and Utah; the Midwestern Region is headquartered in Evansville, Indiana and responsible for Illinois and Ohio coal production; the Eastern Region, located at Washington, Pennsylvania oversees production in Pennsylvania and portions of West Virginia; the Southern Appalachia Region headquartered in Bluefield, Virginia is responsible for Tennessee, Virginia and portions of West Virginia coal production; and the Northern West Virginia Region at Morgantown, West Virginia oversees coal production in a portion of West Virginia.

CONSOL's Illinois coal production since 1971 totals 109.4 million tons. This figure represents 7.8 percent of total Illinois coal production since 1960 and ranks CONSOL fifth in total coal production. Since 1971, CONSOL has continued to increase its annual coal production from 6.2 million tons to 9.9 million tons in 1982. For the past two years, CONSOL's production has stayed at 7.8 million

tons, or about 12 percent of total Illinois coal production. In 1984, CONSOL was producing from three surface-mines in southern Illinois. These three mines ranked third, ninth and twelfth in Illinois mine production.

In 1984, CONSOL's 1,069 mine employees represented 7.2 percent of total Illinois mine employment. Average production per surface-mine employee was 7,318 tons per year, or 23.8 tons per man-day.

The three CONSOL mines producing in Illinois for 1984 were:

Burning Star No.4 is a surface-mine located in Perry County at Cutler². No.4 is the largest Illinois mine in the CONSOL system, the third largest mine in Illinois and ranked in the top sixty, nationally. No.4's production of 3.1 million tons in 1984 was an increase of .5 million tons over 1983. This 1984 production represented 39.8 percent of CONSOL's Illinois production, while its employment accounted for 30.6 percent of CONSOL's Illinois mine employment. Production per mine employee averaged 9,514 tons in 1984, or 27.9 tons per man-day. This figure was an increase of 41 percent over 1983. Since the mine

opened in 1973, 25.6 million tons have been produced. The mine is producing from both the Springfield (No.5) and Herrin (No.6) coal seams, with a stripping ratio of 37:1 and 7:1, respectively. Coal is washed by a "Jig Washing Plant." The coal is transported by Missouri Pacific Railroad (3 million tons in 1984) and sold under long-term contract to Union Electric Company of Missouri.

Burning Star No.2 is a surface-mine located in Perry County at DuQuoin. No.2 has an annual production capacity of 2.2 million tons, with recoverable reserves totaling 26 million tons. Production of 2.4 million tons in 1984 represented 107 percent of production capacity. No.2 ranked ninth in Illinois coal production. No.2's production accounted for 31.1 percent of CONSOL's Illinois production, while No.2's employment represented 37.8 percent of CONSOL's Illinois mine employment. Average production per mine employee in 1984 was 6,027 tons/year, or 20.8 tons per man-day. Burning Star No.2 has a stripping ratio of 16:1. The mine opened in 1950 and has produced 47.7 million tons through 1984. Since 1960, No.2 has mined 41.3 million tons. A "Jig Washing Plant" cleans 100 percent of the coal. Coal is sold under long-term contract to Florida Power Company and Interstate Power Company of Iowa. A unit train loading facility is available for transporting the coal. For 1984, Missouri

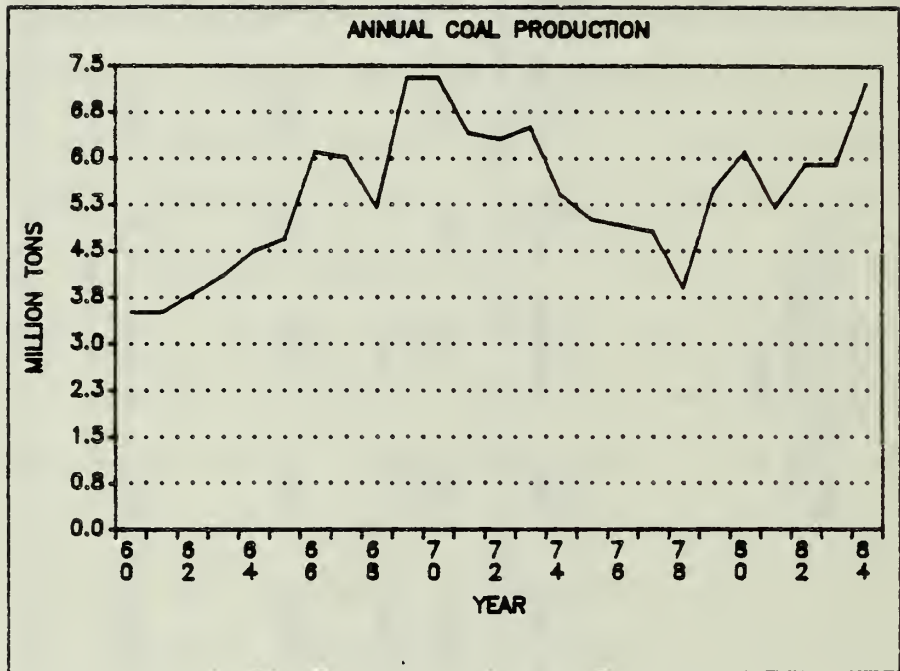
Pacific Railroad transported 2.3 million tons and Illinois Central Gulf Railroad transported 1 thousand tons.

Burning Star No.5 is a surface-mine located in Jackson County at Desoto. It is the twelfth largest coal mine in Illinois. Annual coal production capacity of No.5 totals 3.6 million tons. Coal production in 1984 represented 64 percent of this production capacity. The mine has a remaining useful life of approximately 18 years. Coal production from No.5 represented 29.1 percent of CONSOL's Illinois production, while its employment represented 31.6 percent of CONSOL's mine employment in Illinois. Average production per mine employee for 1984 was 6,737 tons, or 22.9 tons per man-day. The mine first opened in 1976, with to-date production of 17.8 million tons. Burning Star No.5 has a stripping ratio of 21:1. A "Heavy Media Plant" washes 100 percent of the coal. As seen in Table 3-3, Burning Star No.5 produces a quality coal, with a sulfur content of 1.1 percent and BTU/lb of 10,300. Coal is shipped via Missouri Pacific Railroad (2.2 million tons in 1984) to Union Electric Company of Missouri, under long-term contract.

TABLE 3-3
CONSOLIDATION COAL COMPANY
MINE CHARACTERISTICS
1984

MINE	PRODUCTION (000 TONS)	EMPLOY- MENT	MINE VALUE (MILLION \$)	COAL SEAM	DEPTH TO SEAM	COAL THICKNESS	% SULFUR	% MOISTURE	% ASH	% VOLATILE MATTER	% FIXED CARBON	BILL/LB
BURNING												
STAR 4	3,111	327	77.8	HERRIN & SPID.	110' & 40'	3'0" & 6'0"	3.0	12.0	10.0	32-37	45-47	10,900
BURNING												
STAR 2	2,435	404	68.2	HERRIN	92'	6'0"	2.7	12.7	9.5	32-37	45-47	11,400
BURNING												
STAR 5	2,277	338	53.5	HERRIN	125'	5'10"	1.1	N.A.	9.0	N.A.	N.A.	10,300
TOTAL	7,823	1,069	199.5									

N.A. denotes data not available.



OLD BEN COAL COMPANY

OLD BEN COAL COMPANY

Old Ben Coal Company was acquired by Standard Oil Company of Ohio (SOHIO) in August of 1968 for 1 million shares of common stock. According to Moody's Industrial Manual, SOHIO is engaged:

"in all branches of petroleum, specifically exploring; producing; transporting; refining and marketing. The Company further manufactures: automobile accessories; chemicals; plastic; coal; metals; copper and other minerals. SOHIO also maintains a research organization which studies the development of alternative energy resources and other new energy technologies."

SOHIO's business activity is concentrated in the eastern United States from Maine through Virginia and Ohio. SOHIO is the twenty-fourth largest industrial corporation in the U.S. with sales of \$11.7 billion and assets of \$17.5 billion, in 1984.

Old Ben Coal Company has three divisions: the Illinois Division is located in Benton, Illinois, the Indiana Division is headquartered in Oakland City, Indiana and the West Virginia Division is in Thacker, West Virginia. Old Ben Coal Company is headquartered in Lexington, Kentucky, while Standard Oil Company of Ohio

is located in Cleveland, Ohio.

Old Ben Coal Company has coal reserves totaling 1.7 billion tons; with .6 billion tons in the Midwest, .9 billion tons in northern Appalachia, .2 billion tons in central Appalachia and .02 billion tons in Utah. This coal reserve base places Old Ben as the seventeenth largest private owner of coal in the U.S. According to Old Ben,

"these reserves, particularly those in northern and central Appalachia, have competitive advantages in quality, mineability and location."

Of the total reserve base, approximately .2 billion tons are located at active mine sites.

U.S. coal production by Old Ben Coal Company in 1984 was 14.6 million tons, valued at \$465 million. This figure represented 1.6 percent of U.S. coal production and ranked Old Ben as the thirteenth largest coal producer in the U.S. Old Ben has an annual coal production capacity of 15.7 million tons, with 14 million tons in the Midwest and 1.7 million tons in Appalachia. Old Ben produces most of its' coal in Illinois and Indiana.

Since 1960, Old Ben's Illinois coal production

totaled 135 million tons, or 9.6 percent of total Illinois coal production. This places Old Ben third in total Illinois production. In calendar year 1960, Old Ben was producing from four deep-mines in Illinois. For this same year, coal production was 3.5 million tons (7.7% of Illinois production), while mine employment totaled 1,220 (11.6% of Illinois mine employment). Illinois coal production by Old Ben peaked in 1969 at 7.3 million tons (11.3% of Illinois production). This production placed Old Ben third in overall statewide coal production. Since that time, Old Ben's Illinois coal production has stayed between 4 and 6 million tons per year, except for 1984 when it increased to 7.2 million tons. Old Ben attributes this increase in production to stronger demand and a more aggressive marketing plan.

Old Ben's Illinois production in 1984 of 7.2 million tons represented 11 percent of statewide production. This was an increase of 1.3 million tons over 1983. Coal production was from four deep-mines, with a labor force totaling 1,751 (11.8% of Illinois mine employment). Old Ben's production per deep-mine employee averaged 4,087 tons in 1984, or 14.8 tons per man-day.

A description of the four deep-mines operating in 1984 follows.

No.26 is a deep-mine located in Franklin County at Sesser. The coal is of a high quality with 1.8 percent sulfur and 11,500 BTU's per pound of coal. No.26 is Old Ben's largest Illinois mine, ranking eighth in Illinois mine production with 2.5 million tons. No.26 has an annual mine capacity of 1.6 million tons and reserves totaling 45 million tons. Mine No.26 accounted for 34.3 percent of Old Ben's statewide production and approximately 27 percent of Old Ben's Illinois mine employment. In 1984, the average production per mine employee was 5,219 tons, or 18.5 tons per man-day; the highest in Old Ben's Illinois system. No.26 opened in 1968, with production through 1984 of 26.9 million tons. The four deep-mines of Old Ben use a longwall mining recovery method. [Note 10]. Coal is cleaned with a "Norton and Batac Jig Plant." Coal is sold under long-term contract to Georgia Power Company and Wisconsin Electric Power Company, and on the spot market. Coal is transported by rail, or some combination of rail and barge. Railroads transporting the coal in 1984 were Illinois Central Gulf (1.6 million tons), Missouri Pacific (.5 million tons) and Burlington Northern (.03 million tons).

As shown in Table 3-4, Old Ben's coal resources are of a relative high quality. The coal is mined from the

Herrin No.6 seam. Even though the coal is relatively deep at about 650 feet, the seam thickness is equal to, or greater than 8 feet. Sulfur content ranged from 1.2 to 2.5 percent, ranking as a low to medium sulfur coal. BTU's per pound of coal varied from 11,500 to 11,700, making it one of the higher BTU coals in Illinois.

No.25 and No.27 Complex is the second largest Illinois mine in the Old Ben system. It is located in Franklin County at West Frankfort. The complex is the fourteenth largest Illinois mine. The complex has an annual coal capacity of 3.6 million tons, with reserves totaling 35 million tons. Production of 2.1 million tons in 1984 represented 58.3 percent of this capacity. This production represented 29.4 percent of Old Ben's Illinois production, while its 466 mine employees accounted for about 27 percent of Old Ben's Illinois mine employment. The complex had an average production per mine employee of 4,519 tons in 1984, or 17.3 tons per man-day. Since the mine opened in 1977, 11.5 million tons have been produced. Coal is prepared with a "Mogul Jig and Froth Flotation Plant." Facilities are available for unit train loading. Coal is sold under long-term contract to Georgia Power Company and transported by rail/barge. The railroad servicing the complex in 1984 was Illinois Central Gulf (2.1 million tons).

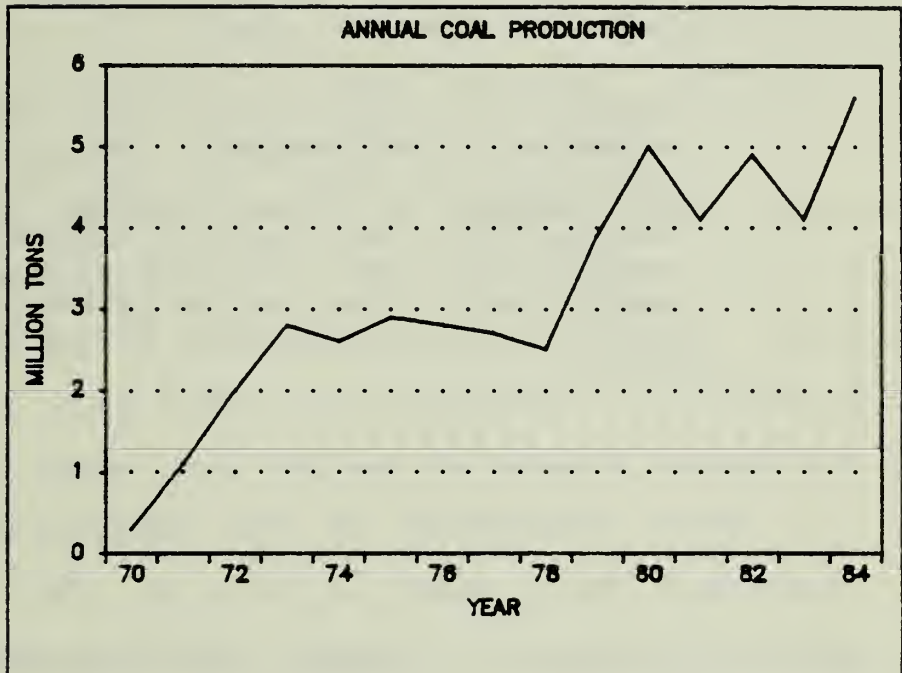
No.24 is a deep-mine located in Franklin County at Benton, which re-opened in October 1983. Mine No.24 has an annual mine capacity of 1.7 million tons, with reserves totaling 25 million tons. Coal production in 1984 of 1.4 million tons represented 82 percent of this capacity. No.24's coal production represented 19.7 percent of Old Ben's Illinois production while its mine employment accounted for 18.6 percent of Old Ben's mine employment. Average tons of production per mine employee in 1984 was 4,334, or 15.8 tons per man-day. The mine opened in 1965, with production through 1984 of 33.9 million tons. Coal preparation is with a "Mogul Jig and Froth Flotation Plant." The coal is transported by rail/barge to Georgia Power Company, under long-term contract. Railroads transporting coal in 1984 were: Burlington Northern (.9 million tons) and Illinois Central Gulf (.6 million tons).

No.21 is a deep-mine located in Franklin County at Sesser. The mine has 20 million tons of recoverable reserves, with an annual production capacity of 1.6 million tons. Production in 1984 of 1.2 million tons represented 75 percent of capacity. Mine No.21 produced 16.5 percent of Old Ben's Illinois production and employed 27.9 percent of Old Ben's Illinois mine

employment. No.21 produces a quality coal with an average sulfur content of 1.2 percent by weight and 11,600 BTU's per pound of coal. The average production per mine employee in 1984 was 2,420 tons, or 8.4 tons per man-day. Since opening in 1960, No.21 has produced 47.1 million tons. One hundred percent of the coal is washed with a "Mogul Jig and Heavy Media Plant." The coal is sold under long-term contract to Union Electric Company in Missouri. Railroads furnishing transportation in 1984 were: Missouri Pacific (1.4 million tons); Illinois Central Gulf (.2 million tons) and Burlington Northern (.1 million tons).

TABLE 3-4
OLD BEN COAL COMPANY
MINE CHARACTERISTICS
1984

MINE	PRODUCTION (000 TONS)	EMPLOY- MENT	MINE VALUE (MILLION \$)	COAL SEAM	DEPTH TO SEAM	COAL THICKNESS	% SULFUR	% MOISTURE	% ASH	% VOLATILE MATTER	% FIXED CARBON	BTU/LB
NO. 26	2,458	471	71.3	HERVIN	651'	8'0"	1.8	11.0	8.0	33.0	48.0	11,500
NO. 25 AND 27	2,106	466	59.0	HERVIN	600'	8'0"	2.5	11.0	9.0	32.0	48.0	11,700
NO. 24	1,413	326	41.0	HERVIN	666'	8'6"	2.4	12.0	8.5	33.6	45.9	11,700
NO. 21	1,181	488	30.1	HERVIN	656'	8'4"	1.2	11.0	8.0	33.0	49.0	11,600
TOTAL	7,158	1,751	201.4									



MONTEREY COAL COMPANY

MONTEREY COAL COMPANY

Monterey Coal Company is a division of Exxon Coal USA, Inc. and a wholly owned subsidiary of Exxon Corporation. According to Moody's Industrial Manual:

"Exxon's principal business is energy, involving exploration for and production of crude oil and natural gas, manufacturing of petroleum and transportation and sale of crude oil, natural gas, and petroleum products; exploration for and mining of coal and uranium, and fabrication of nuclear fuel."

Exxon Corporation is the largest U.S. industrial corporation with sales in 1984 of \$90.9 billion and assets totaling \$63.3 billion. Monterey Coal Company is located in Carlinville, Illinois, while Exxon Coal USA is located in Houston, Texas. Exxon Coal USA also owns The Carter Mining Company headquartered in Gillette, Wyoming. Exxon Corporation is located in New York, New York.

According to Keystone's 1984 Coal Mine Directory, Exxon Coal USA has coal reserves totaling 9.5 billion tons, ranking fourth in privately held coal reserves. These reserves are located in Canada, Illinois, West Virginia and Wyoming. Reserves in the Illinois Basin

total 3.1 billion tons, with most of the reserves in Illinois.

Exxon Coal USA has been a major national coal producer in recent years. In 1984, Exxon Coal USA was producing from 3 deep-mines and two surface-mines. Monterey Coal Company oversees 2 deep-mines in Illinois and one deep-mine in West Virginia, while The Carter Mining Company manages 2 surface-mines in Wyoming. U.S. coal production totaled 23.2 million tons, representing 2.6 percent of U.S. coal production. This was an increase of 3.8 million tons over 1983. Monterey's Illinois coal production represented 24.6 percent of this total. Exxon Coal USA was the seventh largest U.S. coal producer in 1984.

Monterey Coal Company's Illinois coal production was 5.7 million tons in 1984; an increase of 1.6 million tons from 1983. This figure accounted for 8.7 percent of total Illinois coal production. Monterey Coal Company was the fifth largest Illinois coal producer for 1984.

Monterey Coal Company has been mining coal in Illinois since 1970. Monterey has steadily increased its share of Illinois coal production from four percent in 1970 to its current level of about nine percent. Since

1970, Monterey has produced 46.8 million tons, or 3.3 percent of total Illinois coal production. This figure also ranks Monterey as the eleventh largest coal producer since 1960.

Monterey's mine employment in 1984 was 1,143. This figure represented 7.7 percent of total Illinois mine employment. Production per deep-mine employee averaged 4,969 tons in 1984, or 18.9 tons per man-day. These figures also represent a 52 percent increase over 1983.

Table 3-7 lists Monterey's two Illinois mines. Both mines are producing from the Herrin No.6 coal seam at approximately 300 feet. Mine No.1 has a relatively high sulfur content of 3.7 percent and 10,550 BTU, while No.2 has a sulfur content of 3.1 percent and 10,600 BTU.

A description of the two mines in 1984 follows.

No.2 is a deep-mine located in Clinton County at Albers. The 3.3 million tons of production at No.2 ranked: first in Monterey's Illinois production; first in Illinois underground mine production; second in state-wide production and in the top sixty producing mines, nationally. The 3.3 million tons also represented

an increase of .9 million tons over 1983. Mine No.2 accounted for 57.7 percent of Monterey's Illinois production while its employment represented 61.7 percent of Monterey's Illinois mine employment. The mine averaged 4,645 tons of coal per mine employee in 1984, or 18.4 tons per man-day. No.2 has produced 14.1 million tons since opening in 1977. A "Jig Plant" washes 100 percent of the coal. Unit train loading is available. Coal is sold to Public Service Company of Indiana, under long-term contract. Southern Railroad transported 3.3 million tons in 1984.

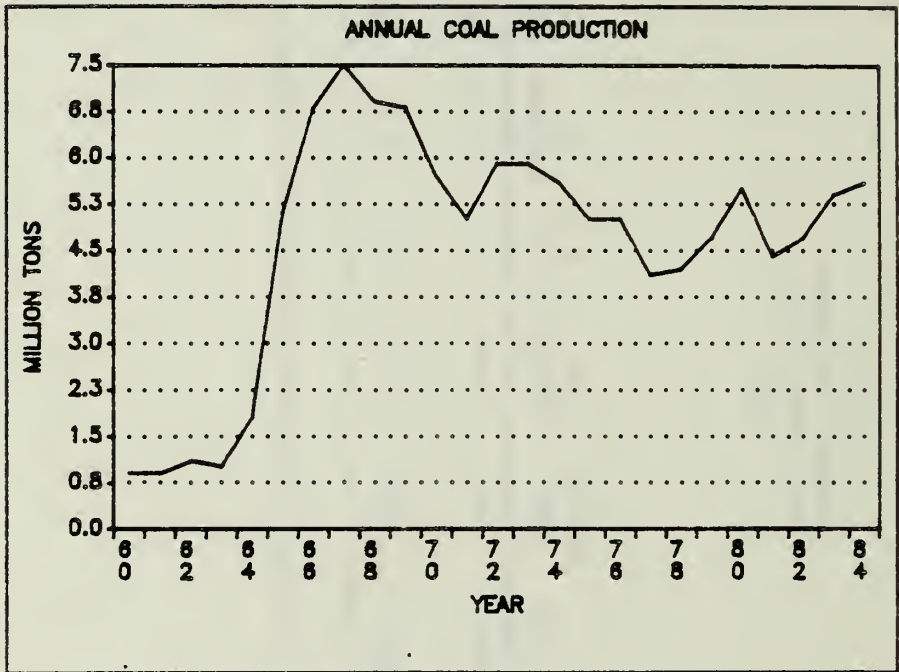
No.1 is a deep-mine located in MaCoupin County at Carlinville. Coal production in 1984 of 2.4 million tons represented 89 percent of its annual mine capacity. No.1 is the tenth largest producing mine in Illinois for 1984. No.1 accounted for 42.3 percent of Monterey's Illinois production, while its labor force represented 38.3 percent of Monterey's Illinois mine employment. Production per mine employee averaged 5,488 tons in 1984, or 17.3 tons per man-day. The mine opened in 1970 with production through 1984 totaling 32.6 million tons. A "Baum Type Jig Plant" washes approximately 100 percent of the coal. A unit train loading facility is available. Coal is sold to Central Illinois Public Service under long-term contract and other utilities via the spot

market. Transportation of the coal is by rail and truck. In 1984, Chicago Northwestern Railroad transported 2.2 million tons.

TABLE 3-5
MONIEREY COAL COMPANY
MINE CHARACTERISTICS
1984

MINE	PRODUCTION (000 TONS)	EMPLOY- MENT	MINE VALUE (MILLION \$)	COAL SEAM	DEPTH TO SEAM	COAL THICKNESS	% SULFUR	% MOISTURE	% ASH	% VOLATILE MATTER	% FIXED CARBON	BTU/LB
NO.2	3,275	705	90.1	HERRIN	330'	7'8"	3.1	15.5	9.1	N.A.	N.A.	10,600
NO.1	2,404	438	70.9	HERRIN	300'	7'3"	3.8	16.5	9.4	34.7	39.4	10,450
TOTAL	5,679	1,143	161.0									

N.A. denotes data not available.



ARCH OF ILLINOIS

ARCH OF ILLINOIS

Arch of Illinois, formerly Southwestern Illinois Coal Company, is a wholly-owned division of Arch Mineral Corporation. Arch Mineral Corporation purchased Southwestern in 1972. Arch Mineral Corporation was formed in 1969 by Mr. Merle Kelce and Mr. William Heckman. Ashland Oil, Inc. in 1969 purchased 50 percent interest in Arch Mineral as an affiliated subsidiary, while the remaining 50 percent was controlled by Mr. Kelce. Today, the company is jointly owned by Ashland Oil (50%) and Hunt Family Interests' (50%). Ashland Oil, based on 1984 sales, is the forty-second largest industrial corporation in the U.S. with sales of \$8.3 billion and assets totaling \$4 billion. No figures are available for Hunt Family Interests'.

Arch Mineral Corporation has coal operations in Alabama, Illinois, Kentucky and Wyoming. According to Ashland:

"Arch is primarily engaged in seeking out, acquiring and developing coal reserves intended to supply the electric utility market, where the majority of coal sales are long-term contracts with market reopener clauses and/or provisions for pass through of various costs, including reclamation,

and the balance are under short-term contracts with fixed prices."

Moody's Industrial Manual further states:

"Ashland Oil Enterprises, a wholly-owned subsidiary of Ashland Oil, Inc. owns a 50 percent interest in a land trust holding title to coal land in southwestern Illinois. These lands are leased to a wholly-owned subsidiary of Arch under a long term lease."

Arch Mineral's coal reserves are estimated at 650 million tons, ranking forty-eighth in privately held reserves. Arch also has additional preference rights to coal reserves in New Mexico. Illinois coal reserves are estimated at 220 million tons.

Arch Mineral Corporation has four coal operating divisions: Arch of Illinois; Arch of Alabama; Arch of Kentucky and Arch Western Division. Arch Mineral Corporation and its divisions are headquartered in St. Louis, Missouri. Ashland Oil Inc. is headquartered in Lexington, Kentucky, while Hunt Family Interests' is located in Dallas, Texas.

Arch Mineral Corporation produced 11 million tons of coal in 1984, representing 1.2 percent of U.S. coal

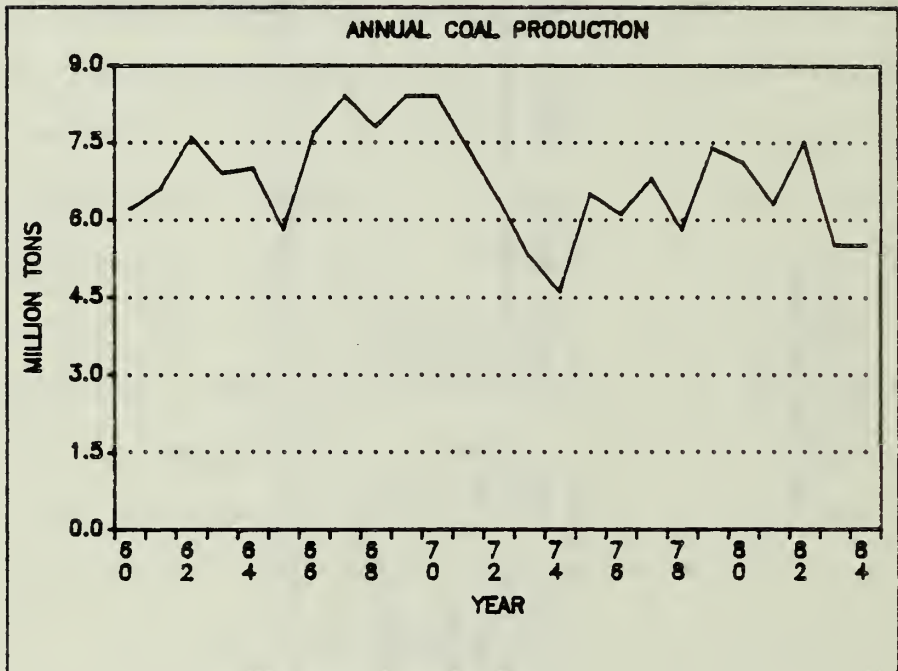
production. This production was an increase of 2.4 million tons over 1983. The coal is sold to 8 major electric utilities, other small electric producers and industry.

Arch of Illinois, including Southwestern Illinois Coal Company, is the fourth largest coal producer in this study. Total coal production was 115.5 million tons (8.3% of Illinois production). In 1961, Southwestern produced .9 million tons of coal, representing about 2 percent of Illinois coal production. Production peaked in 1967 at 7.5 million tons; placing Southwestern third with 11.6 percent of Illinois production. Since that time, production has stayed between 4 and 7 million tons per year. Southwestern's Captain mine is the largest producing mine in the state.

Arch of Illinois employed 975 people and produced 5.6 million tons of coal in 1984. This production placed Arch of Illinois as the sixth largest Illinois coal producer with 8.6 percent of total Illinois coal production. The 975 mine employees represented 6.6 percent of total Illinois mine employment. Coal production per surface-mine employee averaged 5,767 tons in 1984, or 17.7 tons per man-day.

A description of the Captain mine follows.

Captain is a surface-mine located in Perry County at Percy. The Captain mine is ranked: first in Arch of Illinois production; first in state-wide production and in the top fifty producing mines, nationally. The mine is producing from one of the largest contiguous coal reserves in the eastern United States. The Captain mine has an annual production capacity of about 6 million tons per year. Production and mine employment in 1984 were 5.6 million tons and 975, respectively. This production and mine employment were an increase over 1983 of .6 million tons and 194 employees. Average production per mine employee in 1984 was 5,767 tons, or 17.7 tons per man-day. Since opening in 1964, it has produced 83.8 million tons of coal. All the coal from the mine is cleaned with a "McNally Pittsburg Plant." Coal is sold under long-term contract to Georgia Power Company, Illinois Power Company, Missouri Public Service Company and Northern Indiana Public Service Company. Transportation of the coal is by rail and water. In 1984, Illinois Central Gulf Railroad transported 1.6 million tons and Missouri Pacific Railroad moved 4 million tons. Additional data is shown in Table 3-6 on the following page.



FREEMAN UNITED COAL MINING COMPANY

FREEMAN UNITED COAL MINING COMPANY

Freeman United Coal Mining Company is a division of Materials Service Corporation and a wholly-owned subsidiary of General Dynamics Corporation. Prior to November 1966, General Dynamics owned 52.9 percent of United Electric Coal Company; in 1966 they increased ownership to 100 percent. In 1975, Freeman Coal Mining Company (2nd largest coal company in this study) and United Electric Coal Company (7th largest coal company) were combined into Freeman United Coal Mining Company.

Freeman has been mining coal in the Illinois Basin for more than 100 years. Coal reserves are estimated at 600 million tons (51st in privately held coal reserves). The six active mine sites have a coal reserve base of more than 200 million tons. Freeman estimates that about 81 percent of its coal sales are primarily in the Midwest via long-term contracts with utilities, while the remainder is sold to industry.

Today, Freeman United Coal Mining Company is headquartered in Chicago, Illinois, while General Dynamics Corporation's Executive office is located in St. Louis, Missouri. General Dynamics is the forty-fourth

largest industrial corporation in the U.S. (based on sales) with 1984 sales of \$7.8 billion and assets totaling \$3 billion. According to Moody's Industrial Manual, General Dynamics is engaged in:

"engineering, development and manufacture of various products for the United States Government and to a lesser extent, foreign governments, including military equipment, tactical missiles, gun systems, space systems, land systems, submarines and electronics. It also is involved in the mining of coal, the production and distribution of lime, limestone, sand and gravel, ready-mix concrete, building materials and data products."

For this study, Freeman United Coal Mining Company has produced 240.3 million tons. This includes production from both Freeman Coal Company and United Electric Coal Company. This figure represents 17.2 percent of total Illinois coal production and ranks Freeman second in overall production since 1960. Freeman's production peaked in 1967, 1969 and 1970 with 8.4 million tons. In 1974, Freeman's coal production was 4.6 million tons, representing 8 percent of Illinois coal production. Since 1975, Freeman has kept its share of Illinois coal production at 10-12 percent. Freeman's next largest production was in 1982 at 7.5 million tons (12.2% of total Illinois production). In this same year, Freeman was

producing from eight mines, while ranking fifth in Illinois production.

Freeman United Coal Mining Company in 1984 produced 5.5 million tons of coal. Freeman's 1984 output represented 8.4 percent of Illinois production (7th in Illinois coal production). Three surface-mines produced 2 million tons (36% of Freeman's production) and three deep-mines produced 3.5 million tons (64% of production). Freeman employed 1,615 workers at the six mine sites, representing 10.9 percent of total Illinois mine employment. Average production per surface-mine employee in 1984 averaged 5,510 tons, or 15.5 tons per man-day; deep-mine employees averaged 2,787 tons, or 10.7 tons per man-day.

Table 3-7 lists the six active mines in 1984. As shown, Freeman has two mines that are producing coal with a relatively low sulfur content. Orient No.4 is producing a 1.8 percent sulfur coal with 11,750 BTU, while Orient No.6 is mining 1.5 percent sulfur coal and 11,700 BTU.

A description of the 6 active mines in 1984 follows.

Orient No.6 is a deep-mine located in Jefferson.

County at Waltonville. No.6 has an annual mine capacity of 1.5 million tons. Coal production of 1.4 million tons in 1984 represented 93 percent of mine capacity. Orient No.6 is the largest mine in the Freeman system, with 26.1 percent of Freeman's total coal production and 32 percent of Freeman's mine employment. Production per mine employee in 1984 averaged 2,771 tons, or 10.1 tons per man-day. No.6 opened in 1966 with production through 1984 of 21.4 million tons. Coal is prepared with a "Roberts and Schafer Heavy Media Plant." Unit train loading is available. Orient No.6 is one of the deeper mines in Illinois at 792 feet. The coal contains 1.5 percent sulfur and 11,700 BTU. Coal is transported by rail to Electric Energy, Inc. or Union Electric Company, under long-term contract. In 1984, Missouri Pacific Railroad transported 1.3 million tons and Illinois Central Gulf Railroad transported .06 million tons.

Orient No.4 is a deep-mine located in Williamson County at Pittsburg. No.4 has an annual mine capacity of 1 million tons. Production in 1984 of 1.1 million tons represented 110 percent of this capacity and 20 percent of Freeman's production. The mine opened in 1952 and has produced 34 million tons; since 1960, 26.9 million tons. No.4's 353 mine employees represented 21.9 percent of Freeman's mine employment. Coal production per mine

employee in 1984 averaged 3,082 tons, or 11 tons per man-day. A "Roberts and Schafer Heavy Media Plant" is used for cleaning 100 percent of the coal. The coal is of high quality with 11,750 BTU and 1.8 percent sulfur. Most of the coal is sold in Illinois, under long-term contract to Electric Energy, Incorporated. The coal is transported by rail and truck. The railroads transporting the coal in 1984 were Missouri Pacific (.8 million tons) and Illinois Central Gulf (.15 million tons).

Fidelity No.11 is a surface-mine located in Perry County at DuQuoin. No.11 has an annual mine capacity of 1.2 million tons. Coal production in 1984 represented 83 percent of this capacity. No.11 is the largest surface-mine in Freeman's system. No.11's coal production accounted for 18.6 percent of Freeman's total production, while its employment represented 13 percent of Freeman's mine employment. Coal production per mine employee in 1984 averaged 4,838 tons, or 16.4 tons per man-day. Fidelity No.11 has a stripping ratio of 13:1. The mine opened in 1929 with total production of 73.1 million tons, since 1960--36.7 million tons. A "Koppers Jig Plant" cleans 100 percent of the coal. Unit train facilities are available. The coal is sold to Central Illinois Public Service, Hoosier Energy Rural Electric Co-op and Illinois

Power Company. Coal is transported by rail, truck or rail/barge combination. In 1984, Illinois Central Gulf Railroad moved .6 million tons and Missouri Pacific Railroad transported .3 million tons.

Crown II is a deep-mine located in Montgomery County at Virden. Crown II has an annual mine capacity of 2 million tons. The mine produced 1 million tons and employed 389, in 1984. These figures represented 18.1 percent of Freeman's production and 24.1 percent of Freeman's mine employment. Crown II has mined 10.7 million tons since opening in 1976. Coal production per mine employee in 1984 averaged 2,548 tons, or 11.2 tons per man-day. A "Roberts and Schafer Jig Plant" washes 100 percent of the coal. The coal averages 3.2 percent sulfur and 10,500 BTU. Coal is sold under long-term contract to Central Illinois Light Company and Springfield City, Water, Light and Power. Transportation is via rail and truck. Burlington Northern Railroad transported 1 million tons in 1984.

Industry is a surface-mine located in McDonough County at Industry. The mine opened in 1982, with production of .3 million tons. In 1984, mine production was .5 million tons representing 100 percent of mine capacity. Mine employment totaled 98. These 1984 figures

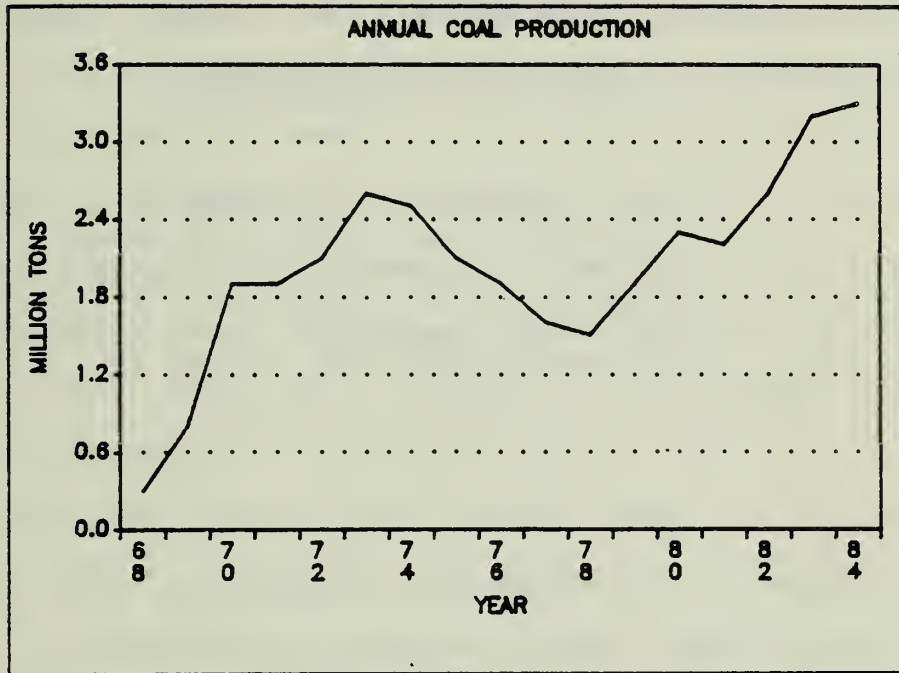
represented 9 percent of Freeman's production and 6 percent of Freeman's mine employment. Average production per mine employee in 1984 was 4,969 tons, or 16.7 tons per man-day. Industry has a stripping ratio of 24:1. A "Roberts and Schafer Jig Plant" cleans 100 percent of the coal. The coal is transported by truck to Muscatine Power and Water Department in Iowa.

Buckheart No.17 is a surface-mine located in Fulton County at Canton. The mine closed in August 1984. No.17 produced .5 million tons and employed 49 in 1984. This production represented 8.4 percent of Freeman's production, while its employment accounted for 3 percent of Freeman's mine employment. No.17 had an average production of 13.1 tons per man-day.. A "Neldo Heavy Media Plant" cleaned 100 percent of the coal. The mine opened in 1937, with total production of 54 million tons; since 1960, 18.7 million tons. Buckheart No.17 had a stripping ratio of 24:1. Coal was sold to Iowa-Illinois Gas and Electric Company, under long-term contract. Transportation of the coal was with Burlington Northern Railroad (.16 million tons).

TABLE 3-7
FREEMAN UNITED COAL MINING COMPANY
MINE CHARACTERISTICS
1984

MINE	PRODUCTION (000 TONS)	EMPLOY- MENT	MINE VALUE (MILLION \$)	COAL SEAM	DEPTH TO SEAM	COAL THICKNESS	% SULFUR	% MOISTURE	% ASH	% VOLATILE MATTER	% FIXED CARBON	BTU/LB
ORIENT NO.6	1,430	516	58.6	HERRIN	792'	7'0"	1.5	11.7	7.6	32.2	48.5	11,700
ORIENT NO.4	1,088	353	42.4	HERRIN	225'	5'6"	1.8	8.5	10.8	36.2	44.4	11,750
FIDELITY NO.11	1,016	210	30.5	HERRIN	80'	6'2"	3.0	12.2	10.0	34.0	44.8	11,100
CROWN II	991	389	45.0	HERRIN	330'	6'0"	3.2	16.5	8.4	36.3	38.8	10,500
INDUSTRY	487	98	12.9	CULCH.	47'	2'1"	2.9	16.3	5.0	38.6	40.2	11,300
HICKORY NO.17	461	49	14.3	SPFLD.	75'	4'6"	2.8	N.A.	10.0	N.A.	N.A.	10,500
TOTAL	5,473	1,615	203.7									

N.A. denotes data not available.



INLAND STEEL COAL COMPANY

INLAND STEEL COAL COMPANY

Inland Steel Coal Company has been mining coal in Illinois since 1966. Inland Steel Coal Company is a wholly-owned subsidiary of Inland Steel Company. According to Moody's Industrial Manual:

"the company is engaged in the production and sale of steel and related products; mining and pelletizing of iron ore, mining of coal and quarrying of limestone, principally for its own use."

Based on 1984 sales, Inland Steel Company was the 116th largest U.S. industrial corporation with sales of \$3.4 billion and assets valued at \$2.6 billion. Inland Steel Coal Company and Inland Steel Company are headquartered in Chicago, Illinois.

Inland Steel Coal Company has coal reserves totaling approximately .3 billion tons. These reserves are located in Illinois, Pennsylvania and West Virginia. According to data published by Keystone's 1984 Coal Mine Directory, Inland's coal reserves rank eightieth in privately held coal reserves. All of the coal reserves are owned by

Inland Steel Company through either fees, leases or sub-leases.

Inland Steel Coal Company became one of the top ten Illinois coal producers in 1970 when it ranked ninth with 1.9 million tons of production (3 percent of Illinois coal production). Since that time, Inland has been in and out of the top ten producers list, until 1978. Since 1978, Inland has been a member of the top ten Illinois coal producers, increasing its production in 1978 from 1.5 million tons (3% of Illinois production) to 3.3 million tons in 1984 (5.1% of Illinois production). For this study, Inland Steel Coal Company is the twelfth largest Illinois coal producer with 34.7 million tons.

In 1984, Inland was the eighth largest coal producer. Employment totaled 1,120 representing 7.6 percent of total Illinois mine employment. Production per deep-mine employee averaged 2,955 tons in 1984, or 12.2 tons per man-day. Both mines are utilizing room and pillar coal removal technique.

As shown in Table 3-8, Inland's two coal operations are producing a high quality coal. The mines are two of the deeper active mines in Illinois. Mine No.1 is producing a coal with .9 percent sulfur and 11,750 BTU,

while Mine No.2 is producing at .9 percent sulfur and 12,000 BTU.

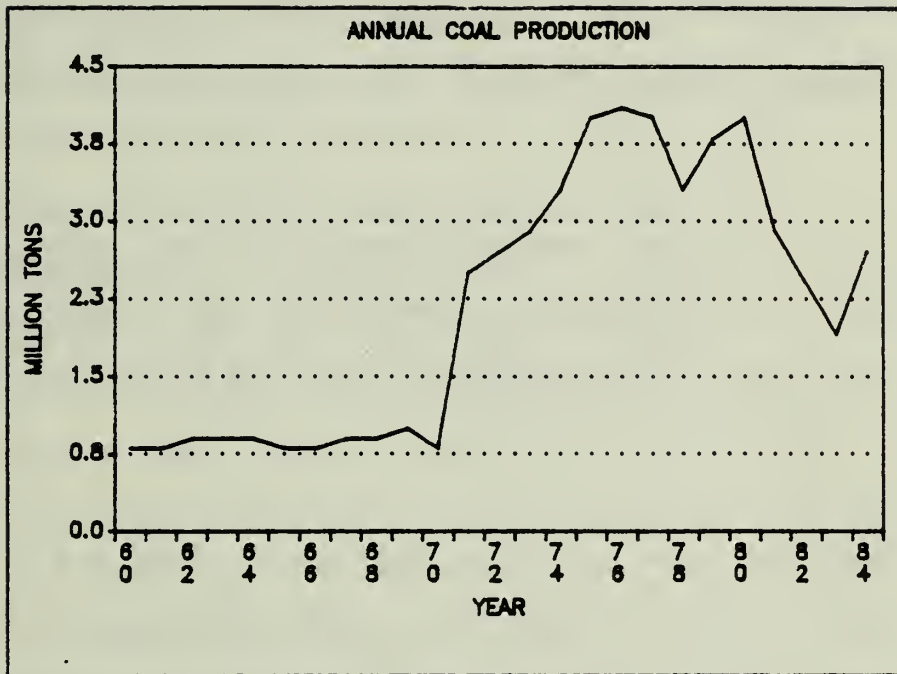
The two deep-mines operating in 1984 are described below:

No.1 is a deep-mine located in Jefferson County at Sesser. No.1 is the largest mine in Inland's Illinois system and the eleventh largest Illinois mine. Mine No.1 has an annual mine capacity of 1.8 million tons. Coal production in 1984 of 2.3 million tons represented 128 percent of capacity and 70.6 percent of Inland's Illinois production. The 646 mine employees accounted for 57.7 percent of Inland's Illinois mine employment. Average production per mine employee in 1984 was 3,619 tons, or 14.4 tons per man-day. A "Heavy Media Plant" cleans 100 percent of the coal. Unit train loading is also available.

The mine has produced 31.3 million tons since 1967. Mine No.1 has remaining coal reserves of approximately 90 million tons. The coal is classified as a low sulfur high BTU coal, with specifications of .9 percent sulfur and 11,750 BTU. Coal is sold under contract to Union Electric Company. A majority of the coal is transported by rail. In 1984, Illinois Central Gulf Railroad transported 1.6

million tons and Missouri Pacific Railroad moved .6 million tons.

No.2 is the second deepest Illinois mine at 929 feet. No.2 is located in Hamilton County at McCleansboro. Remaining coal reserves are estimated at 90 million tons. These reserves are held by Inland Steel Coal Company under a sublease from AMAX, Inc. In 1984, 1 million tons were mined, representing 29.4 percent of Inland's Illinois coal production. No.2's employment of 474 accounted for 42.3 percent of Inland's Illinois mine employment. Production per mine employee averaged 2,050 tons, or 8.9 tons per man-day. No.2 opened in 1979 with production through 1984 totaling 3.4 million tons. A "Heavy Media" preparation plant cleans 100 percent of the coal. Unit train loading is available. As with Mine No.1, this coal is of high quality, with .9 percent sulfur and 12,000 BTU. Louisville and Nashville Railroad transported 1 million tons of coal in 1984.



ZEIGLER COAL COMPANY

ZEIGLER COAL COMPANY

Zeigler Coal Company was merged into Houston Natural Gas Corporation on December 14, 1973 with the exchange of 2.862 Corporation shares for each share of Zeigler Coal Company stock. According to Moody's Public Utility Manual, Houston Natural Gas Corporation is engaged in:

"the transmission and sale of natural gas; marine transportation, services and construction; production, processing and sale of industrial gases; production and sale of coal; and exploration for and production of oil and gas."

Most of the coal is sold f.o.b. mine and transported by rail, barge, truck, or some combination of these. The coal is of steam quality and sold to electric utilities and large industrial users. All of its coal is sold directly to its customers.

Zeigler Coal Company is headquartered in Des Plaines, Illinois, while its operations office is located in Coulterville, Illinois. Houston Natural Gas Corporation is located in Houston, Texas.

Zeigler Coal Company has recoverable coal reserves estimated at 1 billion tons. Based on statistics published by Keystone's 1984 Coal Mine Directory, these coal reserves rank Zeigler thirty-second in privately held reserves. Some of the recoverable Illinois reserves are: Rend Lake mine--54 million tons; No.6 mine--45 million ton; Christian County--135 million tons; Worden mines--72 million tons; Tamora mine--81 million tons and the Marine-Troy reserve totaling 118 million tons.

Zeigler Coal Company first made the top ten Illinois coal producers list in 1968 with production of .9 million tons (1.5% of Illinois coal production). Since 1974, it has been on the top ten producers list with annual production between 2 and 4 million tons. Production peaked in 1976 at 4.1 million tons, representing 7.1 percent of total Illinois coal production (7th in Illinois production). For the twenty-five year period of this study, Zeigler Coal Company ranked ninth in total Illinois coal production with 54 million tons. This figure represented 3.9 percent of all Illinois coal production since 1960.

In 1984, Zeigler was producing from three underground-mines in southern Illinois. Production totaled 2.7 million tons, representing 4.1 percent of

total Illinois production. This production ranked Zeigler ninth in total Illinois coal production. Mine employment for 1984 was 654 (4.4% of total Illinois mine employment). The three underground-mines had an average production per mine employee of 4,084 tons in 1984, or 14 tons per man-day. All three mines are utilizing room and pillar coal removal technique.

Table 3-9 shows some of the characteristics of the three mines and their respective coal qualities. All three mines are producing at a shallow depth for an underground mine, while the coal seam thickness is relatively thick at 7 feet. All three operations are mining Herrin No.6 coal with a sulfur content of 2.4 to 3.0 percent.

A description of Zeigler's three underground-mines follows.

No.11 is an underground-mine located in Randolph County at Coulterville. Coal production in 1984 of 1.2 million tons represented about 170 percent of its annual capacity. No.11 is the largest mine in Zeigler's Illinois system. A labor force of 263 represented 40.2 percent of Zeigler's Illinois mine employment, while No.11's

production accounted for 43.1 percent of Zeigler's Illinois coal production. Coal production per mine employee averaged 4,380 tons in 1984, or 17.6 tons per man-day. The mine opened in 1975 with production through 1984 of 5.3 million tons. No.11 utilizes a "Roberts and Schafer" preparation plant located at the Spartan mine. Coal is sold under long-term contract to Interstate Power Company, Northern Indiana Public Service and Wisconsin Power and Light. Coal is transported by rail, barge, truck, or some combination. In 1984, Missouri Pacific Railroad transported .7 million tons.

No.5 is an underground-mine located in Douglas County at Murdock. Production in 1984 of .8 million tons represented about 40 percent of its annual mine capacity. Coal production from No.5 accounted for 31.6 percent of Zeigler's Illinois coal production, while No.5's employment of 238 represented 36.4 percent of Zeigler's Illinois mine employment. Average production per mine employee in 1984 was 3,546 tons, or 13.8 tons per man-day. The mine opened in 1973, with coal production through 1984 totaling 12 million tons. According to Illinois Department of Mines and Minerals' data, the No.5 and Murdock mines use the same "McNally Pittsburg" preparation plant. Coal is transported by rail to Northern Indiana Public Service and Rochester Public Utilities in

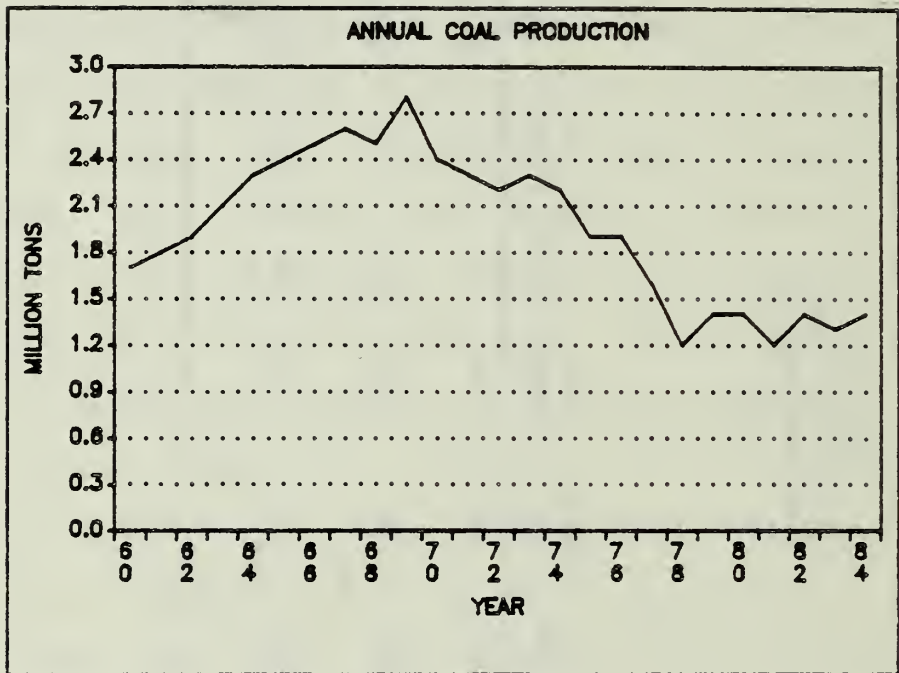
Minnesota, under long-term contract. Coal was transported by Missouri Pacific Railroad (.8 million tons in 1984).

Murdock is an underground-mine located in Douglas County at Murdock. The mine has an annual mine capacity of 1.6 million tons. Production of .7 million tons in 1984 represented 44 percent of mine capacity. Murdock's coal production in 1984 accounted for 25.3 percent of Zeigler's Illinois coal production, while its employment represented 23.4 percent of Zeigler's Illinois mine employment. Coal production per mine employee averaged 4,412 tons, or 10.5 tons per man-day. Production began in 1946 with production through 1984 totaling 16 million tons; since 1960--12.8 million tons. A "McNally Pittsburg" preparation plant cleans the coal. Coal is sold under long-term contract with Springfield City, Water, Light and Power, while some is sold on the spot market. Coal is transported by truck.

TABLE 3-9
ZEIGLER COAL COMPANY
MINE CHARACTERISTICS
1984

MINE	PRODUCTION (000 TONS)	EMPLOY- MENT	MINE VALUE (MILLION \$)	COAL SEAM	DEPTH TO SEAM	COAL THICKNESS	% SULFUR	% MOISTURE	% ASH	% VOLATILE MATTER	% FIXED CARBON	BTU/LB
NO. 11	1,152	263	35.7	HERRIN	210'	7'0"	3.0	N.A.	10.0	N.A.	N.A.	10,700
NO. 5	844	238	25.3	HERRIN	210'	7'0"	2.9	N.A.	10.5	N.A.	N.A.	10,800
MURDOCK	675	153	16.2	HERRIN	180'	7'0"	2.4	N.A.	10.5	N.A.	N.A.	10,500
TOTAL	2,671	654	77.2									

N.A. denotes data not available.



SAHARA COAL COMPANY

SAHARA COAL COMPANY

Sahara Coal Company is owned and operated as an independent coal mining company. It has been operating in Illinois since 1905. The Company is headquartered in Chicago, Illinois, while the main operating office is located in Harrisburg, Illinois.

Sahara Coal Company has recoverable coal reserves estimated at 180 million tons, located in Saline and Williamson counties. These reserves are currently being mined at four operations: one strip-mine; one drift-mine; and two underground-mines. The drift and underground-mines are removing the coal via room and pillar technique.

Coal production for the period 1960-1984 totaled approximately 48.6 million tons, representing 3.5 percent of total Illinois coal production. Sahara Coal Company has been in and out of the top ten Illinois coal producers list since 1960. Sahara first became one of the top ten Illinois coal producers in 1960, when it ranked eighth with 1.7 million tons of production and 3.8 percent of total Illinois coal production. Since 1960, Sahara has

continued to increase its annual coal production, with only a few exceptions, until 1969 when it peaked at 2.8 million tons. In this same year, Sahara ranked seventh with 4.3 percent of Illinois coal production. For the past fourteen years, Sahara's production has decreased to its current level of 1.4 million tons and 2.1 percent of Illinois coal production.

In 1984, Sahara was the eleventh largest Illinois coal producer. In this same year, Sahara's 542 mine employees represented 3.7 percent of Illinois mine employment. The drift and underground-mines in 1984 averaged 2,147 tons per mine employee, or 12.1 tons per man-day; while the surface-mine averaged 4,250 tons, or 27.4 tons per man-day.

A description of Sahara's four mines follows.

Mines No.6, No.7, No.21, and No.22 are located in Saline County at Harrisburg. All of the mines use a central washing plant for cleaning 100 percent of the coal. As shown in Table 3-10, the coal is of high quality with 2 percent sulfur and a BTU content of 12,400. The coal is sold to Electric Energy, Inc. in Illinois and Rochester Public Utility Department in Minnesota, under

long-term contract. Other coal sales are on the spot market. Coal is transported by rail, barge, truck, or some combination.

No.21 is an underground-mine with an annual mine capacity of .8 million tons. Production of .6 million tons in 1984 represented about 75 percent of this capacity. It is the largest mine in Sahara's Illinois system. No.21 accounted for 43 percent of Sahara's Illinois coal production, whereas 257 mine employees represented 47.4 percent of Sahara's Illinois mine employment. The average annual production per mine employee was 2,393 tons in 1984, or 13.1 tons per man-day. No.21 has produced 7.1 million tons since 1971. Coal is removed by room and pillar.

No.6 is a strip-mine with an annual production capacity of .6 million tons. Coal production in 1984 of about .5 million tons, represented 91 percent of this capacity. No.6's production accounted for 38 percent of Sahara's coal production, while its 128 employees accounted for 24 percent of Sahara's Illinois mine employment. The mine in 1984 had an average annual production of 4,250 tons per mine employee, 27.4 tons per man-day. No.6 opened in 1936 with production through 1984 of 32.6 million tons. Since 1960, No.6 has produced 19.5

million tons.

No.7 is an underground-mine which opened in 1982. In 1984, the mine produced approximately .2 million tons, accounting for 14.7 percent of Sahara's Illinois coal production. The 121 mine employees represented 22.3 percent of Sahara's Illinois mine employment. Since opening in 1982, No.7 has mined .4 million tons. Average production per mine employee in 1984 averaged 1,744 tons, or 10.3 tons per man-day. No.7 utilizes room and pillar coal removal.

No.22 is an underground-mine with an annual mine capacity of .14 million tons. In 1984, production of about .05 million tons represented 47 percent of mine capacity. No.22's coal production in 1984 accounted for 4.4 percent of Sahara's total Illinois production, while No.22's 36 mine employees accounted for 6.6 percent of Sahara's total Illinois mine employment. The average tons of production per mine employee averaged 1,750 in 1984, or 10.6 tons per man-day. No.22 opened in 1979 with total production through 1984 of .4 million tons. The mine utilizes room and pillar coal removal.

TABLE 3-10
SABRA COAL COMPANY
MINE CHARACTERISTICS
1984

MINE	PRODUCTION (000 TONS)	EMPLOY- MENT	MINE VALUE (MILLION \$)	COAL SEAM	DEPTH TO SEAM	COAL THICKNESS	% SULFUR	% MOISTURE	% ASH	% VOLATILE MATTER	% FIXED CARBON	BTU/LB
NO.21	615	257	20.3	SPED.	240'	4'4"	2.0	7.8	7.8	34.3	50.3	12,400
NO.6	544	128	18.0	HERRIN	50' TO 115'	4'6"	2.0	7.8	7.8	34.3	50.3	12,400
NO.7	211	121	7.0	HERRIN	180'	4'6"	2.0	7.8	7.8	34.3	50.3	12,400
NO.22	63	36	2.1	HERRIN	60' TO 100'	4'10"	2.0	7.8	7.8	34.3	50.3	12,400
TOTAL	1,433	542	47.4									

SECTION III: ILLINOIS COAL DATA

Mine Employment And Production

Coal Production At The County Level

Coal Prices And Revenue

Coal Mine Operations And Illinois State
Product

MINE EMPLOYMENT AND PRODUCTION

From an historical perspective, Illinois employment from all coal mines peaked in 1923 at 103.6 thousand employees, while coal production peaked in 1918 at 90 million tons. Since that time, mine employment and production have been unstable, with dramatic shifts through the years to their 1984 level of 14.8 thousand employees and 65.3 million tons of production. For the period 1960-1984, mine employment peaked in 1979 at 18.5 thousand, while the lowest level of employment was 1962, 1965 and 1967 with 8.8 thousand. Coal production, for this same period, peaked in 1972 at 65.5 million tons, with the lowest level of production in 1961 at 45.1 million tons.

Many of these changes in employment and production have occurred because of continuous improvements in mining technology, increased mine capacity, coal strikes and the volatility of year-to-year coal sales. To illustrate these changes in employment, a comparison was made of average tons of production per mine employee per year. This was performed by taking the yearly coal production and dividing by total number of employees, for that same

year. In 1923 the average production per mine employee was 741 tons; increasing to 1,924 tons in 1950 and 3,955 tons in 1983. Because of these increases in average mine employee production, Illinois mine employment has decreased by 671 percent, while statewide average tons of production have increased by 534 percent.

Although coal mine employment has decreased because of increased efficiency and mechanization, as well as minimal growth in coal sales, many benefits have also been achieved, such as: coal prices have stayed competitive with alternative sources of energy; wages and fringe benefits are equal to, or greater than other industries; the work environment is cleaner and fatal mine accidents have been reduced dramatically.

To illustrate a difference in wages, compare the data in Table 4-1. In this Table, average weekly earnings, average weekly hours and average hourly earnings are shown for three Illinois industries. For a description of these industries refer to Note 11. Based on average weekly earnings, bituminous coal miners have received from 50 to 75 percent more in weekly income than individuals from the manufacturing and durable goods industries. This higher than average wage is primarily because of unionization and the work environment of the

coal industry. To show the "ups and downs" of the mining industry, average weekly hours of bituminous coal miners were compared to average weekly hours of the two other industries shown in Table 4-1. The Table shows that coal miners have a more volatile work week, ranging from a low of 36.8 hours in 1978 to a high of 47 hours in 1971, while the average work week of the other two industries has stayed relatively the same at 40-41 hours. Also, Graph 4-1 compares the average weekly earnings of bituminous, manufacturing and durable good employees. As shown, weekly wages of workers in the manufacturing and durable goods industries have increased at relatively the same rate, whereas bituminous miners' wages have increased more dramatically in recent years.

Deep-mine coal operations are considered labor intensive, while surface-mine operations are considered capital intensive. Table 4-2 compares the average tons of production per deep and surface-mine employee per year. Over the 25 year period encompassed in this study, production per deep-mine employee averaged 3,742 tons, while strip-mines averaged 7,430 tons, a 200 percent difference. Table 4-2 further illustrates the improvement in strip-mine efficiency-- in 1967 the average production per mine employee peaked at 10,889 tons. On the other hand, the deep-mine average production per mine employee

TABLE 4-1
AVERAGE WEEKLY EARNINGS, HOURS AND HOURLY EARNINGS
BITUMINOUS, MANUFACTURING AND DURABLE GOODS EMPLOYEES
1960-1984

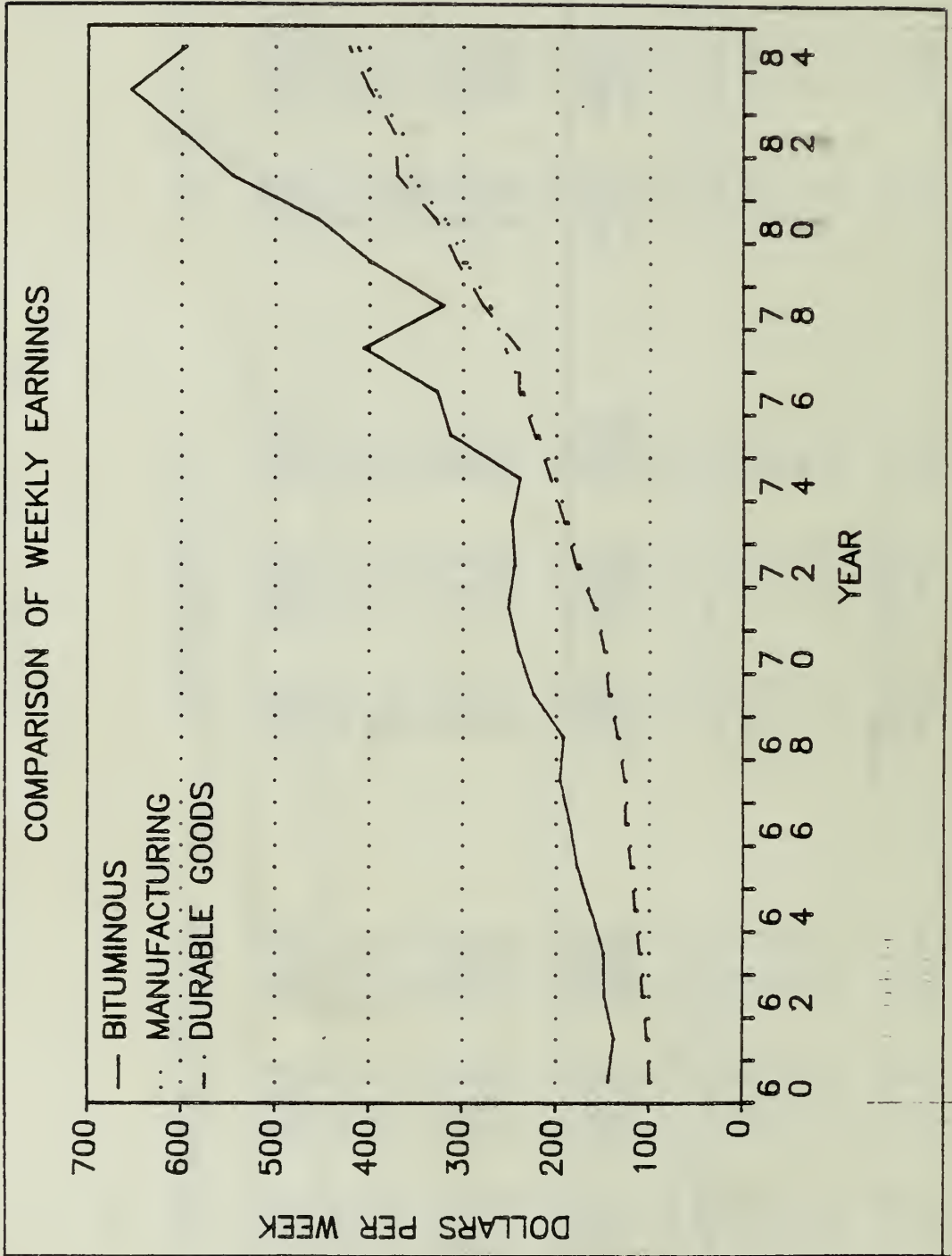
YEAR	AVERAGE WEEKLY EARNINGS			AVERAGE WEEKLY HOURS			AVERAGE HOURLY EARNINGS		
	BITUMINOUS	MANUFACTURING	DURABLE GOODS	BITUMINOUS	MANUFACTURING	DURABLE GOODS	BITUMINOUS	MANUFACTURING	DURABLE GOODS
1984	595.34	412.29	421.71	37.5	41.0	41.2	15.85	10.06	10.23
1983	654.17	393.59	400.04	43.0	40.6	40.7	15.21	9.69	9.83
1982	597.58	364.86	373.16	41.5	39.2	39.2	14.40	9.31	9.52
1981	545.55	356.23	370.18	39.6	40.0	40.4	13.78	8.91	9.16
1980	455.01	319.20	329.11	39.8	39.8	40.0	11.43	8.02	8.23
1979	398.02	296.66	306.21	40.5	40.7	41.0	9.83	7.29	7.47
1978	320.69	271.42	278.61	36.8	40.1	40.3	8.71	6.77	6.91
1977	406.50	254.91	240.70	46.5	40.6	37.6	8.74	6.28	6.40
1976	327.98	236.11	240.19	39.7	40.4	40.6	8.26	5.84	5.92
1975	313.38	219.13	223.38	40.9	39.7	39.8	7.66	5.52	5.61
1974	238.45	200.69	205.98	41.4	40.4	40.6	5.76	4.97	5.07
1973	247.79	187.85	191.93	41.2	41.2	41.5	6.01	4.56	4.62
1972	244.12	175.55	179.16	43.6	41.0	41.3	5.60	4.28	4.34
1971	251.52	157.57	159.26	47.0	40.1	40.3	5.35	3.93	3.95
1970	240.42	147.03	148.75	45.7	40.3	40.5	5.26	3.65	3.67
1969	224.39	141.69	144.07	45.8	41.0	41.3	4.90	3.46	3.49
1968	191.73	132.53	134.43	43.8	40.8	41.1	4.38	3.25	3.27

TABLE 4-1 CONTINUED

YEAR	AVERAGE WEEKLY EARNINGS			AVERAGE WEEKLY HOURS			AVERAGE HOURLY EARNINGS		
	BITUM INOUS	MANUFAC TURING	DURABLE GOODS	BITUM INOUS	MANUFAC TURING	DURABLE GOODS	BITUM INOUS	MANUFAC TURING	DURABLE GOODS
1967	195.90	125.04	126.78	46.1	40.8	41.0	4.25	3.06	3.09
1966	185.24	123.04	125.58	44.4	41.7	42.1	4.17	2.95	2.98
1965	177.46	117.28	120.04	43.7	41.4	41.9	4.06	2.83	2.86
1964	163.22	113.00	115.92	42.6	41.0	41.5	3.83	2.76	2.79
1963	149.42	108.71	110.93	40.7	40.7	41.1	3.67	2.67	2.70
1962	148.48	105.27	107.52	40.9	40.6	40.9	3.63	2.59	2.63
1961	137.64	100.99	102.62	38.0	40.1	40.3	3.62	2.52	2.55
1960	143.36	97.70	99.51	39.4	40.0	40.1	3.64	2.44	2.48

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

GRAPH 4-1



peaked in 1967 at 5,128 tons. Although this figure represents only 47.1 percent of the strip-mine average production for this same year, since 1923 it represents an increase of 698 percent. From an historical perspective, given the percentage changes in average production per mine employee per year between surface and deep-mine operations, the greatest improvements in efficiency have been achieved in deep-mine operations.

Table 4-2 further shows employment and production patterns of deep and surface-mine operations from 1960 through 1984. Overall, deep-mines have produced 51.1 percent of total Illinois coal production and employed 67.3 percent of the labor. Comparing 1960 to 1984, deep-mine production has increased by approximately 73 percent, while deep-mine employment has increased by only 54 percent. As a percent total Illinois coal production, deep-mines peaked in 1984 at 61.2 percent. Since 1974, the percent of total coal production has varied from 53 to 61 percent, while deep-mine employment has ranged from 69 to 73 percent. The balance of these percentages are those percentages which apply to surface-mines.

Another important consideration of yearly coal production and tons of production per mine employee was contract negotiations between the United Mine Workers of

TABLE 4-2
PRODUCTION AND EMPLOYMENT
DEEP AND SURFACE MINE OPERATIONS
1960-1984

YEAR	DEEP-MINE OPERATIONS					SURFACE-MINE OPERATIONS				
	TONS	% OF TOTAL PRODUCTION	EMPLOYMENT	% OF TOTAL EMPLOYMENT	AV. PROD. PER EMPLOYEE	TONS	% OF TOTAL PRODUCTION	EMPLOYMENT	% OF TOTAL EMPLOYMENT	AV. PROD. PER EMPLOYEE
1984	39,945,487	61.2	10,857	73.3	3,679	25,343,704	38.8	3,946	26.7	6,422
1983	33,370,383	57.2	10,514	71.2	3,174	25,003,197	42.8	4,245	28.8	5,890
1982	35,683,871	58.1	10,554	70.6	3,381	25,744,299	41.9	4,396	29.4	5,856
1981	29,235,503	56.4	13,351	73.6	2,190	22,563,150	43.6	4,797	26.4	4,704
1980	34,968,673	55.9	13,219	72.3	2,645	27,573,744	44.1	5,065	27.7	5,444
1979	32,681,230	54.9	13,200	71.4	2,476	26,856,897	45.1	5,299	28.6	5,068
1978	24,889,581	51.1	12,620	70.7	1,972	23,854,568	48.9	5,241	29.3	4,552
1977	29,588,977	54.9	11,375	70.6	2,601	24,291,457	45.1	4,739	29.4	5,126
1976	30,911,696	53.2	10,396	70.6	2,973	27,224,448	46.8	4,335	29.4	6,280
1975	31,880,083	53.5	9,549	70.0	3,339	27,658,936	46.5	4,097	30.0	6,751
1974	31,104,112	53.6	8,718	69.9	3,568	26,968,528	46.4	3,749	30.1	7,194
1973	32,577,353	60.8	7,794	68.3	4,180	20,971,317	39.2	3,615	31.7	5,801
1972	31,715,795	48.4	7,870	70.0	4,030	33,805,599	51.6	3,367	30.0	10,040
1971	29,453,926	50.4	7,088	67.1	4,155	28,961,313	49.6	3,483	32.9	8,315
1970	31,615,570	48.7	6,785	66.4	4,660	33,268,533	51.3	3,429	33.6	9,702

TABLE 4-2 CONTINUED

DEEP-MINE OPERATIONS						SURFACE-MINE OPERATIONS					
YEAR	TONS	% OF TOTAL PRODUCTION	EMPLOY- MENT	% OF TOTAL EMPLOYMENT	AV. PROD. PER EMPLOYEE PER YEAR	TONS	% OF TOTAL PRODUCTION	EMPLOY- MENT	% OF TOTAL EMPLOYMENT	AV. PROD. PER EMPLOYEE PER YEAR	
1969	30,172,627	46.5	5,944	62.0	5,076	34,659,957	53.5	3,647	38.0	9,504	
1968	26,084,430	42.0	6,028	63.2	4,327	36,058,646	58.0	3,510	36.8	10,273	
1967	27,650,000	42.7	5,392	61.2	5,128	37,164,771	57.3	3,413	38.8	10,889	
1966	27,132,171	42.9	5,566	61.9	4,875	36,080,526	57.1	3,428	38.1	10,525	
1965	25,571,442	43.9	5,470	62.2	4,675	32,661,038	56.1	3,320	37.8	9,838	
1964	24,878,351	45.4	5,703	62.8	4,362	29,956,137	54.6	3,376	37.2	8,873	
1963	24,426,009	47.3	5,497	61.8	4,444	27,216,422	52.7	3,394	38.2	8,019	
1962	23,750,040	49.1	5,471	62.4	4,341	24,603,873	50.9	3,303	37.6	7,449	
1961	22,205,581	49.2	5,537	61.9	4,010	22,926,945	50.8	3,408	38.1	6,727	
1960	23,113,105	50.4	7,040	66.8	3,283	22,707,527	49.6	3,493	33.2	6,501	
TOTAL OR AVERAGE	734,605,996	51.1	8,462	67.3	3,742	704,125,532	48.9	3,924	32.7	7,430	

America (UMWA) and the Bituminous Coal Operators Association (BCOA). These negotiations take place approximately every three years. Since 1960 the UMWA and BCOA have been on strike five times: 1968 for 6 days; 1971 for 44 days; 1974 for 27 days; 1978 for 111 days and 1981 for 72 days. The strike of 1978 had a dramatic impact on coal production, reducing Illinois' coal production to 48.7 million tons, the lowest production level since 1963.

COAL PRODUCTION AT THE COUNTY LEVEL

The Illinois Department of Mines and Minerals estimate total coal production since 1882 at approximately 5 billion tons. Production was located in 71 counties throughout the state, of which the top ten counties produced 3.5 billion tons, or 70 percent of this total. Even though coal deposits are spread throughout most of the state, production has been in a few central and southern counties of the state.

Franklin County, located in the southern part of the state is the largest coal producing county with 641.3 million tons (12.8% of total Illinois production). In 1984, Franklin County ranked second at 7.8 million tons, or 11.9 percent of 1984 production. Seven of the counties that appear in Table 5-1, also appear in Table 1-2. This indicates that those counties with a majority of the coal resources are also the counties with the most coal production.

Table 1-2 lists the top ten counties with deep and surface-minable high potential resources by county, type of resource and percent of total remaining resources,

whereas Table 5-1 lists the top ten producing counties by: total production since 1882; percent of total production; 1984 production and percent of total production for 1984. An interesting point of Table 5-1 was the comparison of "to-date" production to "1984" production. These percentages have stayed relatively the same at 70 percent of total Illinois coal production. Comparing the two columns of percentages indicate that most counties' to-date and 1984 production have stayed within three percent of one another, except for Perry and Sangamon Counties. Not shown in Table 5-1 is how coal production has shifted from one region to another. These shifts have occurred, through the years, between central and southern Illinois.

Table 5-2 lists the top ten counties with high potential deep and surface-minable coal resources and their respective total mine value. These figures are based on the 1984 average price per ton of \$31 for deep-mines and \$27 for surface-mines. The total value of these coal resources is estimated at \$.8 trillion dollars, with Washington, Christian, Montgomery, Sangamon and Macoupin Counties at \$.1 trillion, each.

TABLE 5-1
 TOP TEN COAL PRODUCING COUNTIES
 PRODUCTION AND PERCENT OF TOTAL
 1882-1984

COUNTY	TOTAL PRODUCTION (TO-DATE)	% OF TO-DATE PROD.	PRODUCTION (1984)	% OF 1984 PROD.
FRANKLIN	641,329,930	12.8	7,788,141	11.9
WILLIAMSON	444,666,281	8.9	3,991,273	6.1
PERRY	408,171,360	8.1	14,995,637	23.0
ST. CLAIR	360,731,220	7.2	2,246,721	3.4
CHRISTIAN	338,315,705	6.7	3,009,648	4.6
FULTON	312,839,720	6.2	1,066,545	1.6
MACOUPIN	309,787,507	6.2	3,395,459	5.2
SALINE	270,786,005	5.4	5,191,311	8.0
SANGAMON	233,449,607	4.7	0	.0
RANDOLPH	194,796,221	3.9	4,236,427	6.5
TOTAL	3,514,873,556	70.1	45,921,162	70.3

SOURCE: Illinois Department of Mines and Minerals.

TABLE 5-2
 TOP TEN COUNTIES
 HIGH POTENTIAL COAL RESOURCES AND VALUE
 BASED ON 1984 ESTIMATED F.O.B. MINE VALUE

COUNTY	BILLION TONS	BILLION DOLLARS
WASHINGTON	3,503	110.0
CHRISTIAN	3,481	109.3
MONTGOMERY	3,466	108.8
SANGAMON	3,426	107.6
MACOUPIN	3,048	95.7
CLINTON	2,150	67.5
VERMILION	2,144	67.3
FAYETTE	1,992	62.5
LOGAN	1,977	62.1
PERRY	1,868	55.8
TOTAL	27,055	846.6

COAL PRICES AND REVENUE

The demand for Illinois coal is a function of the need and price it receives in the marketplace. This demand and price are further influenced by the quality of the coal (% sulfur, % ash, % moisture, BTU/lb); type of end-user; availability and price of alternative fuels; transportation costs; size of coal reserves; coal supplier reliability; taxes and environmental constraints.

In recent years, more than 85 percent of Illinois coal was sold to the electric utility industry; 18.4 million tons in Illinois and 37.8 million tons outside of Illinois. The electric utilities bid for stable long-term contracts which may or may not allow for built in price escalation. Secondly, they seek reliable coal suppliers who can guarantee a given quantity and quality of coal for the life of the generating station. Further, they may require a given coal quality that meets certain environmental guidelines established by federal and state laws.

The price per ton of coal as discussed in this report is free-on-board average mine price (f.o.b. mine

price). F.o.b. mine price only includes the mine cost of coal, insurance and taxes and excludes transportation and transportation related expenses. In comparison, the delivered price of coal to the end-user includes all cost components. In most cases, f.o.b. mine price is from 25 to 99 percent of the delivered cost of coal to the end-user. A report published by the Illinois Energy Resources Commission concluded that transportation costs can add to the f.o.b. mine price of Illinois coal by less than 1 percent to as much as 75 percent, depending on distance transported, mode of transportation and tonnage. The smallest transportation cost would be those operations that are mine-mouth (the generating station is adjacent to the coal mine), while the greatest transportation cost would be those out-of-state end-users consuming Illinois coal. For example, Illinois utilities consuming Illinois coal in 1982 averaged \$4.40 per ton in transportation cost, while the highest out-of-state transportation cost was \$23 per ton.

Because transportation costs are excluded in this study, the f.o.b. mine price will be less than the delivered price of coal. Further, in recent years, the overall percentage increase in the f.o.b. mine price has been less than the overall percentage increase in the delivered price because of the deregulation of railroads.

The last six years have seen increases in transportation costs as high as 340 percent.

Total f.o.b. mine value of the 1.4 billion tons produced from 1960 through 1984 was estimated at 17.7 billion. This was determined by taking the total production per year times the respective average f.o.b. mine price and adding the 25 year total. For calendar year 1984, revenue from the 65.3 million tons of coal was f.o.b. mine valued at approximately \$2 billion. In this same year, the average price per ton of deep-mine production was \$31.40, while surface-mine production was valued at \$27.48 per ton. The weighted average f.o.b. mine price, from both surface and underground mines was \$29.88. In recent years, the cost of production from underground mines has been about 15 to 20 percent greater than surface-mines, thus the difference in the price per ton of coal. It is worth noting that the statewide average f.o.b. mine price was determined by taking the total mine value of the coal and dividing by total production. In most cases, the f.o.b. mine price for specific mining operations will be different than this statewide average.

In 1960, the average f.o.b. mine price was \$4 per ton. Since that time, the price of coal has increased by

approximately 647 percent. For the period 1960-1965, the average f.o.b. mine price of coal was reduced by an average 1.3 percent per year, from \$4 per ton in 1960 to \$3.74 per ton in 1965. Over the next 8 years, the average mine price per ton of coal started escalating by an average 10.6 percent per year, from \$3.85 per ton in 1966 to \$6.71 per ton in 1973. With the advent of the Arab oil embargo, the price per ton of coal, along with all other fossil-fuels, started escalating dramatically. From 1973 to 1974, the average mine price per ton of coal increased by 49 percent, almost two-thirds of the total increase of the previous 8 years. Calendar year 1974, saw the first average mine price of \$10 per ton and in 1978 the price had increased to over \$20 per ton. Since 1973, the average mine price has increased by approximately \$23 per ton, or 345 percent.

Another measure and more accurate measurement of f.o.b. mine price is cents per million BTU. This calculation is used to compare the various types of coal, as well as other sources of energy, since it is difficult to compare tons of coal to barrels of oil, to kilowatthours of electricity, to cubic feet of natural gas. Assuming an historical 21.5 million BTU per ton of Illinois coal, the following cost per million BTU can be calculated. In 1960, the average mine price was 18.6

cents per million BTU, while in 1984 the price increased to 139 cents per million BTU. This calculation was performed by taking the average mine price for a specific year and dividing by the millions of BTU per ton of coal.

Table 6-1 lists the average f.o.b. mine price for surface-mines, underground-mines and a weighted average for all mines from 1960 through 1984. Also, Graph 6-1 shows the average mine prices by type of coal operation and year. The emphasis of this graph is the minimal growth of the trend lines in the beginning years and how these lines increase dramatically after the Arab oil embargo. Graph 6-2 projects the total mine revenue in billions of dollars from 1960 through 1984. The point of interest between these two graphs is that Graph 6-1 shows a continuous increase in f.o.b. mine price after 1972, while Graph 6-2 shows peaks and valleys after 1972. This indicates that the percentage change in f.o.b. mine price, in many cases, was less than the overall percentage change in production.

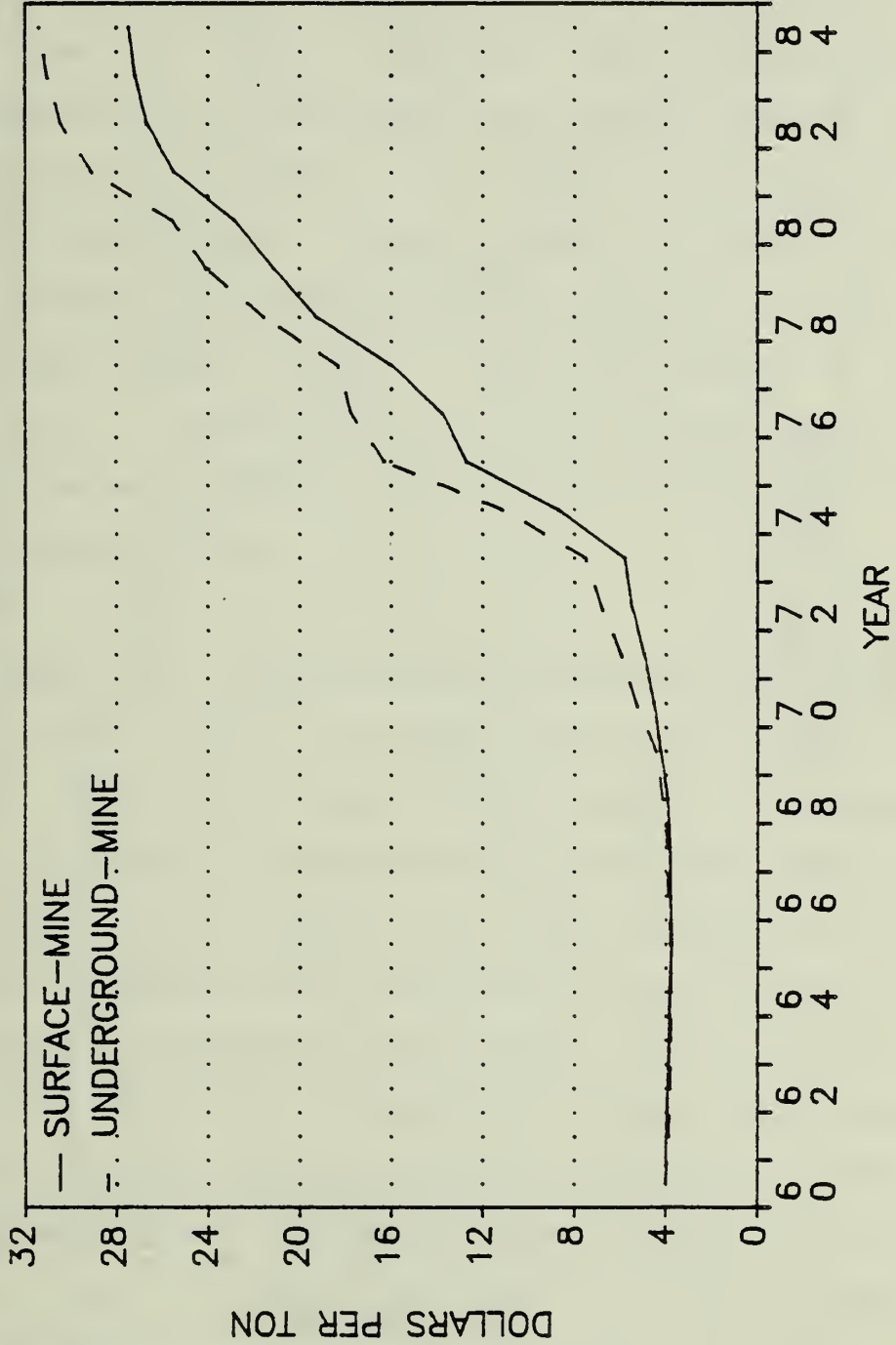
A comparison was also made on the average cost of coal based on sulfur content. Monthly fuel adjustment filings to the Illinois Commerce Commission by Central Illinois Light Company, Central Illinois Public Service, Commonwealth Edison Company, Illinois Power Company,

TABLE 6-1
AVERAGE AND TOTAL FOB MINE VALUE
BY TYPE OF MINE AND YEAR
1960-1984

YEAR	SURFACE (\$ TON)	UNDERGROUND (\$ TON)	AVERAGE TOTAL (\$ TON)	REVENUE (BILLION)
1984 est.	27.48	31.40	29.88	1.951
1983	27.20	31.05	29.42	1.717
1982	26.67	30.44	28.84	1.772
1981	25.48	29.07	27.50	1.424
1980	22.86	25.58	24.39	1.525
1979	21.13	24.08	22.75	1.354
1978	19.27	21.56	20.44	.996
1977	15.99	18.34	17.28	.931
1976	13.78	17.76	15.90	.924
1975	12.72	16.30	14.64	.872
1974	8.70	11.12	10.00	.581
1973	5.81	7.52	6.71	.413
1972	5.49	6.83	6.14	.402
1971	4.95	5.96	5.46	.319
1970	4.53	5.33	4.92	.319
1969	4.23	4.43	4.32	.281
1968	3.92	4.14	4.01	.249
1967	3.83	3.96	3.88	.251
1966	3.81	3.90	3.85	.243
1965	3.72	3.78	3.74	.218
1964	3.81	3.76	3.79	.208
1963	3.83	3.77	3.80	.196
1962	3.90	3.81	3.86	.187
1961	3.96	3.87	3.91	.176
1960	4.01	4.00	4.00	.183
TOTAL				17.692

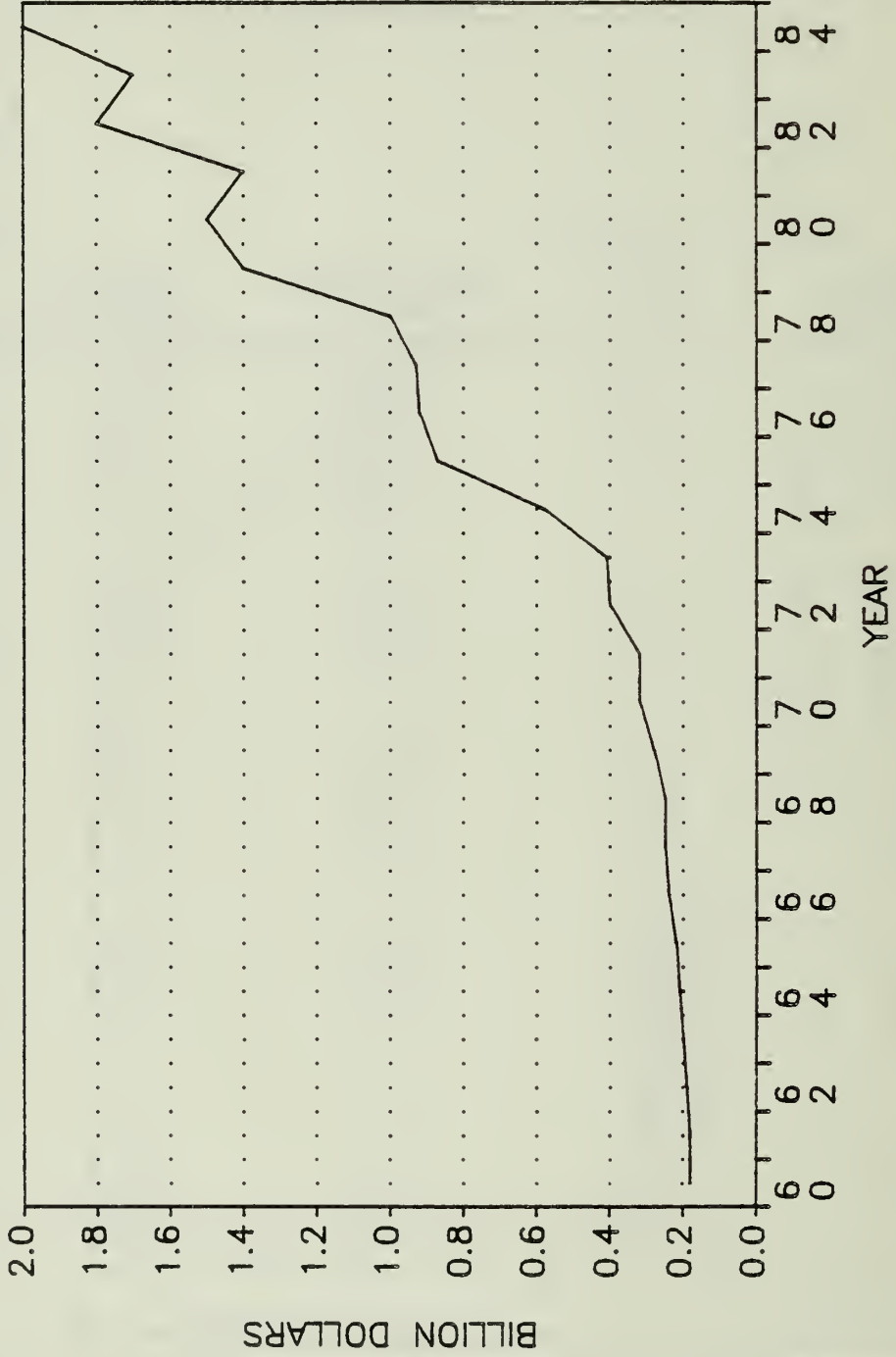
GRAPH 6-1

AVERAGE MINE PRICE



GRAPH 6-2

TOTAL MINE REVENUE



Interstate Power Company, Iowa-Illinois Gas and Electric Company and Union Electric Company were evaluated. These filings break down, in most cases, the monthly quantity and type of fuel, supplier, fuel characteristics, transportation cost and total cost to individual utilities and generating station. The study period encompassed calendar year 1984. Sulfur content was broken down by those categories listed in a previous section titled "low to medium sulfur content." The five categories were: less than 1 percent sulfur; 1 to 1.5 percent sulfur; 1.6 to 2.5 percent sulfur; 2.6 to 3 percent sulfur and greater than 3 percent sulfur.

Based on the evaluation, it was determined that the lower sulfur coals, on average, were priced almost equal to the coals with a higher sulfur content. When compared on a BTU basis, the lower sulfur coals were cheaper than the higher sulfur coals. Also, the data base on sales to end-users indicates that a majority of the low sulfur high BTU coals are being sold out-of-state. These states could have more stringent environmental controls which demand a better quality coal. Further, because of distance transported, the out-of-state users are wanting a better quality coal to reduce the cost per million BTU of delivered coal.

The "less than 1 percent sulfur" coal ranged in price from \$24.88 to \$32.52 per ton, with a weighted average of \$29.47; the "1 to 1.5 percent sulfur" coal varied from \$19.54 to \$42.41 per ton, with a weighted average of \$27.40; the "1.6 to 2.5 percent sulfur" coal varied from \$18.55 to \$44.41 per ton, with a weighted average of \$31.10; the "2.6 to 3 percent sulfur" coal ranged from \$19.55 to \$42.33 per ton, with a weighted average of \$28.31 and the "greater than 3 percent sulfur" coal ranged from \$18.71 to \$45.42 per ton, with a weighted average of \$29.26.

COAL MINE OPERATIONS AND ILLINOIS STATE PRODUCT

As a percent of Illinois State Product (ISP), coal mining has not been that important to the overall market value of goods and services produced in Illinois. The Department of Commerce and Community Affairs' Illinois Data Book lists the ISP for a ten year period, through 1982. For 1971, the mine value of Illinois coal production accounted for approximately one-half percent of ISP; coal production was valued at \$319 million while ISP was \$63.3 billion. In recent years, the percent of total mine value to ISP has increased to approximately one percent.

Even though the percentage of ISP because of coal mining is minimal, it must be remembered that much of the coal mining activity is located in the lower one-third of the state. Because this area is not heavily industrialized or commercialized like many other areas of the state, coal mining in many cases is the major economic activity. Further, because of the multiplier effect, that is, dollars being passed from one consumer to another in the form of purchasing power, the economic impact is even greater. Assuming a multiplier, established by the United

Mine Workers of America of 2.25, the total economic impact of coal production was estimated at \$5 billion.

Because the overall economic impact of mining is minimal at the state level, an attempt was made to gather total market value data on goods and services produced at a county level. Public documents were evaluated to determine if such data was compiled at the county level. After researching various documents, it was determined that no such data was collected at either the state or county level. Because this market value data was not available, a "second best" approach was used.

Data was collected at the county level on employment and personal income from the Bureau of Economic Analysis' (BEA) Local Area Personal Income and County Business Patterns published by the U.S. Department of Commerce. These figures were used to derive the percentage of employment and personal income from coal mining in selected counties. Ten counties were studied to determine the percentage contribution of coal mining activity to overall county employment and personal income. Coal mining employment percentages were determined by taking mining employment and dividing by overall county employment. However, in most cases, a general category of mining was used and includes all mining activity, not just

coal mining. According to BEA:

"personal income consists of income received by, or on behalf of, all residents of an area. It includes the income received by persons from all sources, that is, from participation in production, from transfer payments, from government and business, and from government interest, which is treated like a transfer payment. Persons consist of individuals, nonprofit institutions, private noninsured welfare funds and private trust funds."

The personal income percentage was derived by taking county personal income from mining and dividing by total county personal income. As with employment, these figures include all types of mining, not just coal mining.

Of the ten counties studied, mine employment accounted for 9.2 percent of total county employment, while personal income represented 12.1 percent of total income. These figures indicate that on average, miners receive a higher annual income than other types of employment at the county level. The highest percentage of employment and income from mining were seen in the counties of: Franklin where mining employment accounted for 24.5 percent of employment and 28.3 percent of personal income; Macoupin-- 11.4 percent of total employment and 12.2 percent of total personal income and Perry-- mining employment 22.7 percent,

with 36 percent of personal income. The smallest impacts of mining were seen in the counties of: Fulton with 4.2 percent of employment and 5.5 percent of personal income and St. Clair at 1.8 percent of employment and 2.4 percent of personal income. Couple these percentages with the multiplier effect and mining does impact the overall economic performance of many Illinois counties.

APPENDIX A

NOTES

[Note 1] CLASSIFICATION OF COAL RESERVES. The Illinois State Geological Survey classifies "high potential for development" as having characteristics of those coal deposits currently being mined. They are coal seams that are more than 4.5 feet thick and less than 400 feet deep, or more than 5.5 feet thick and less than 1,000 feet deep. "Moderate potential for development" includes coal deposits currently being leased, but slightly thinner and/or deeper than seams currently being mined. This is coal excluded from the high potential category that is greater than 3.5 feet thick and less than 1,000 feet deep, or greater than 4.5 feet thick and less than 1,200 feet deep, or greater than 5.5 feet thick with no limit on depth. "Low potential for development" are those coal seams that

have inferior characteristics such as minimal coal thickness, depth of overburden, shale partings, etc. "Restricted resources" are those deposits hampered by location due to cities, dams, highways, public lands, or other surface areas that might be impacted by subsidence. For deep-mine operations, approximately 50 percent of the coal seam can be removed with room and pillar mining, whereas longwall mining can remove up to 90 percent of the coal seam. Surface mine operations can remove up to 100 percent of the coal seam, but on average about 85 percent. If the coal is washed, an additional 5 percent of the coal is lost.

[Note 2] SPRINGFIELD COAL SEAM. The Springfield (No.5) seam was formerly called the Springfield and/or Harrisburg (No.5) Coal. The term Harrisburg has been dropped by the Illinois State Geological Survey.

[Note 3] DEPTH OF COAL. The older the coal seam the greater the depth of coal, with the greatest depth of all coals occurring at the center of the Illinois Basin Coal Field in southeastern Illinois. As the seam moves outward from the center of the Basin, the deposits become shallower. For example, for any given area, the Springfield (No.5) seam will always lie below the Herrin (No.6) coal seam and the Herrin (No.6) will always lie below the Danville. (No.7) seam. However, the actual depth of each coal seam will vary from one area to another because of terrain and past soil erosion. For a more thorough discussion of the coal seams in Illinois see: Department of Energy and Natural Resources' Illinois Energy Plan Volume 4 titled, An Inventory of Coal Resources of Illinois, prepared by the Illinois State Geological Survey.

[Note 4] LOW TO MEDIUM SULFUR COAL.

For greater detail of low to medium sulfur coal resources, one should read "Murphysboro Coal, Jackson and Perry Counties: resources with low to medium sulfur potential" published by the Illinois State Geological Survey.

[Note 5] MARKET POWER OF COAL COMPANIES. The level of market power is important from a theoretical perspective. When four or less firms control a minimum of fifty percent of output, then they have some level of market power, or influence over price and output. In this case, other coal producers will look to the leaders for output and price determination. This is less significant in the coal industry, since coal is considered a differentiated product. However, the market is seeking reliable coal prices and supply and it is the major coal producers who can guarantee such supplies.

[Note 6] RANKING OF COAL RESERVES.

It should be remembered throughout this section of the report that the ranking of coal reserves, by individual company, only lists those companies that have furnished coal reserve data to Keystone's 1984 Coal Mine Directory. It is possible there are many companies that have not furnished this information.

[Note 7] MINE PRODUCTION CAPACITY.

The data used in determining annual mine production capacity was derived from public documents or private sources. With public documents, in many cases, mine production capacity was given in tons of production per day. To determine the annual production, this figure was multiplied by 240. However, annual mine production is determined by a number of variables which can adjust this figure. For example, the production capacity may be for only one shift per day, whereas a mine could add shifts to increase production. Other

variables which also may increase capacity are: increased labor force; additional capital equipment and longer work day or week, etc.

[NOTE 8] PRODUCTION PER MINE EMPLOYEE. The average tons of production per mine employee were derived by dividing annual coal production by the number of mine employees. Mine employees included: coal miners; supervisors and mine support staff. Tons per man-day were derived by dividing annual mine production by total number of employee hours. In deriving tons per man-day, the following categories were available: Underground-minehours; surface at underground hours; strip-mine hours; auger hours; culm bank hours; dredge hours; other surface hours; central shop hours; preparation plant hours; office workers and total mine hours. For this study, total mine hours were used in deriving the tons per man-day. It

is difficult to compare one mine to another because all mines do not include the same categories. For example, some mines may have a central shop, preparation plant and office workers; while other mines may use these facilities in conjunction with other mines.

[Note 9] COAL PREPARATION PLANTS. A coal preparation plant is used for cleaning and sizing of raw coal before it is transported. Coal preparation is a term for describing the physical and/or mechanical processes applied to coal to make it suitable for a particular need. Coal cleaning is any process that separates coal from non-coal minerals, which may be mixed with coal when mined. This mixture, called raw coal or run-of-mine (ROM) coal, includes clays, shales, and sulfur bearing pyrites. These minerals are located above and below the coal seam and within the coal seam itself. Cleaning processes include

physical methods and chemical methods. Chemical methods currently are too expensive to be commercially feasible. Chemical methods remove about 65% of all sulfur, while physical methods remove only 30 percent. Physical coal cleaning methods are used broadly in the Illinois Basin. Coal companies own the facilities, usually found near tipples of specific mines. Cleaning facilities vary from simple structures to large complex structures where several types of physical processes occur simultaneously. Each large facility consists of large modular units, either as duplicates for increased volume or as different basic types for different functions. The system divides and cleans many fractions of the raw coal and recycles water and other process agents. All physical coal cleaning processes in the Illinois Basin today operate by gravity separation. In coal cleaning, the clean coal is lighter than the mineral debris and segregates on top.

The principal reason cleaning facilities have many kinds of modular units is that the coal comes in different size chunks, which require different types of gravity separation units. Machines called crushers reduce the size of the large chunks so that the more evenly sized product can be divided into three basic fractions known as coarse, medium and fine. Screens or Sizers separate the feed into coarse, medium, and fine fractions. Coal enters the top of the device and falls on a series of shaking or vibrating screens, which may be tilted so that the overall coal feed will move across, as well as through the screens. Screening may be wet or dry. In wet screening, water mixed with the coal pushes the coal across and through the screens. The screen mesh may be perforated plates or woven sieves, or spaces between parallel bars, depending on the size of the coal. Jigs, for coarse coal, (1 to 6 inch chunks) are

so named because they jiggle the coal. They cause the light coal to jiggle upward and the heavy mineral debris to move downward. The main component of a jig is a very long trough that holds water and coal. A perforated divider running the length of the trough keeps the coal on one side but permits water to flow on both sides. During jiggling, the water on both sides of the divider is made turbulent by pneumatic devices acting on the coal-free side. This turbulence jiggles the coal, causing it to stratify above the mineral debris. The coal feed, which already may be mixed with water to form a slurry, enters at one end, flows the length of the trough, and leaves two exits at the far end. Clean coal leaves by the upper exit and mineral debris leaves the lower exit. Heavy Media Vessels are used for coarse coal. Mineral debris has a greater specific gravity than coal. Bituminous coal has a greater specific gravity than water

and sinks. Heavy media vessels contain a heavy fluid mixture of water and magnetite. This fluid can be adjusted so that the coal will float and the debris will sink. The coarse feed enters the heavy media vessel, and after some stirring and settling, coal is drawn off the top and mineral debris exits near the bottom. Later, the magnetite suspension is separated from the coal and mineral fractions, and recycled. Cyclones are used for medium coal (.02 to 1 inch). Small coal particles in heavy media float more slowly than large ones, and separate too inefficiently and slowly from the mineral particles. An increase in gravitational force separates them more quickly. In the cyclone, centrifugal force takes the place of gravity and exerts much more force on the particles. The coal feed, as a heavy media slurry, enters a vertical, funnel-shaped chamber. During the spin process, mineral debris slides down the sides of the

cyclone while clean coal rises through the center and is drawn off the top. Washing Tables are for medium coal and requires a tilted table with parallel ribs. The ribs project from the surface and against the slope, as in contour farming. Coal enters the table as a slurry at the top of the tilt and is shaken back and forth in the direction of the ribs. Clean coal washes over the ribs while mineral debris collects in the furrows. Toward the end of process, the clean coal collects at the base of the tilt while mineral debris collects at right angles to the coal at the end of the furrows. Froth Flotation is used for fine coal known as "fines" (less than .02 inch). Initial crushing produces significantly greater amounts of fines than does digging the raw coal. Fines are essentially dust and respond extremely slow to gravity. A slurry of fines is mixed with a chemical substance which adheres to coal surfaces but not to the surfaces of

mineral debris. This chemical substance also adheres to air bubbles so that coal particles will join with the air bubbles. In a froth flotation vessel, the slurry and its chemical assistant are aerated with air bubbles entering from below. The coal rises to the top as a froth, while the mineral debris sinks or remains in the aqueous slurry. Dewatering of clean coal is required because most cleaning processes use water. Consequently, freshly cleaned coal is wet. This water adds weight, decreases burning quality and can cause handling difficulties. Several devices dry the coal immediately after cleaning. Vibrating screens shake water from coarse coal. Medium and fine coal may be placed in centrifuges and spun dry. Approximately one-third of the cleaning facilities in the Illinois Basin use centrifuges. Another process, most appropriate for fines, is the vacuum thickener, in which water is evaporated under vacuum

conditions. Sources: COAL RESOURCES FACT BOOK and Dictionary of Mining, Mineral, and Related Terms.

[Note 10] LONGWALL MINING. Longwall mining is a coal removal technology which allows the removal of 58 to 90 percent of a coal deposit. The technology is laid out much like room and pillar mines, but uses a panel 500 to 1,000 feet wide and 1,500 to 2,000 feet long. The coal is removed by either a plow or shear which moves along the face of the wall. A plow operates much like a carpenter's plane, removing a thin layer of coal as it moves along the face, while a shearer is a self propelled track mounted machine with rotating cutting heads, much like a continuous miner. Roof supports, consisting of hydraulic jacks or shields are used to support the roof, once the coal is removed. As the coal is further removed, the jacks or shields are advanced, thus allowing the unsupported roof to

subside into the cavity. According to Coal Mining and Processing, there are 9 faces utilizing longwall mining in Illinois. These 9 faces represent about 11 percent of Illinois' 1984 coal production.

[Note 11] COMPARISON OF INDUSTRIES.

The three industries compared in this section are: bituminous coal mining, manufacturing and durable goods. Bituminous coal mining includes establishments primarily engaged in producing bituminous coal. This industry includes underground mining, auger mining, strip mining, culm bank mining, and coal cleaning, crushing, screening, and sizing plants, whether or not operated in conjunction with the mines served. The bituminous industry carries a Standard Industrial Classification (SIC) Major Group 12. Durable goods are establishments engaged in the distribution of automobiles and other motor vehicles; automobile parts and supplies;

furniture and home furnishings; lumber and other construction materials; sporting, recreational, photographic, and hobby goods, toys and supplies; metals and minerals, except petroleum; electrical goods; hardware, and plumbing and heating equipment and supplies; machinery, equipment and supplies and miscellaneous durable goods. This industry is classified as SIC Major Group 50. The manufacturing industry includes establishments engaged in the mechanical or chemical transformation of materials or substances into new products. These establishments are usually described as plants, factories, or mills and characteristically use power driven machines and materials handling equipment. Establishments engaged in the assembling component parts of manufactured products are also considered manufacturing if the new product is neither a structure nor other fixed improvement. The materials processed by manufacturing

establishments include products of agriculture, forestry, mining, and quarrying as well as products of other manufacturing establishments.

Manufacturing has a SIC code from 20 to 39. Source: Standard Industrial Classification Manual, 1972, Office of Management and Budget, Office of the President.

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